THE GEOGRAPHICAL JOURNAL

Vol CXVIII Part 2 June 1952

EVEREST: THE 1951 RECONNAISSANCE OF THE SOUTHERN ROUTE Eric Shipton 117

MAPPING ROMAN LIBYA R. G. Goodchild 142

BRITISH GEOGRAPHY AND THE AMERICAN GEOGRAPHICAL SOCIETY, 1851–1951 J. K. Wright 153

SOVIET PLANS FOR IRRIGATION AND POWER: A GEOGRAPHICAL ASSESSMENT A. A. Grigoryev 168

THE COASTLINE OF SCOTLAND J. A. Steers 180

WHAT IS AN ENGLISH GEOGRAPHICAL NAME? M. Aurousseau 191

THE EROSIONAL GRADING OF CONVEX AND CONCAVE SLOPES C. A. Cotton 197

GEOGRAPHY IN JUGOSLAVIA J. Roglić 205

SOME DEFINITIONS IN THE VOCABULARY OF GEOGRAPHY 209

FROM THE *JOURNAL* A HUNDRED YEARS AGO 211

THE REGIONAL GEOGRAPHY OF BRITAIN: Review G. H. J. Daysh 212

THE ROYAL GEOGRAPHICAL SOCIETY, LONDON, S.W.7

JOHN MURRAY, 50, ALBEMARLE STREET, W.1

PRICE SEVEN SHILLINGS AND SIXPENCE

THE GEOGRAPHICAL JOURNAL is published by the Royal Geographical Society and is edited by the Director. It contains accounts of recent Exploration and Travel, original contributions to Geographical Research, papers read at the Meetings of the Society, and articles on every aspect of Geography as well as on the geographical aspects of other sciences. It is fully illustrated with photographs and with maps compiled or drawn from the authors' surveys by the draughtsmen of the Society. It contains also Reviews of geographical books and maps; the Society's News; a Record of Geographical Work; and Letters from Correspondents. Contributions to the *Journal* should be addressed to the Editor.

The *Journal* is sent free to all Fellows of the Society. Copies are available to the public through all booksellers and John Murray, 50 Albemarle Street, W.1, who is responsible for trade distribution. It may also be ordered direct from the Office of the Society.

The subscription rate is Thirty-two Shillings per year, post free, single copies Seven Shillings and Sixpence.

ADVERTISEMENTS: All inquiries for Advertisement space in the *Journal* should be addressed to the Office of the Society, Telephone Kensington 2173.

The Postal Address of the Society is
KENSINGTON GORE, LONDON, S.W.7
The address for Inland Telegrams is
OBTERRAS SOUTHKENS LONDON
and for Cablegrams
OBTERRAS LONDON
The Telephone Number is KENSINGTON 5466 (3 lines)

JUST PUBLISHED

THE CITIZEN'S ATLAS
OF THE WORLD

TENTH EDITION

The new edition of this well-known atlas has been thoroughly revised and brought up to date with the many recent world political alterations.

The Citizen's is now accepted by the discriminating public, throughout the world, as a standard work of reference.

Maps: 200 pages in full colour, mainly political for clear reference, but supplemented with physical maps for each region. Several new maps have been introduced to show recent world changes. *Index*: 157 pages, listing nearly 100,000 place names, each of which gives simple reference to map page number and small rectangle. *General Information*: 10 pages of World Statistical Tables including details of population, areas, geographical names, etc.

Bound in Red Buckram **Page size 14½ ins. × 10 ins.**

PRICE £6-6-0 NET

Obtainable through your booksellers or direct from the publishers. A detailed prospectus will be sent free on application.

JOHN BARTHOLOMEW & SON LTD.
12 DUNCAN STREET · EDINBURGH 9

CAMTORS
TRADE MARK

Specialists in Expeditionary and high-altitude Tents and Equipment.

The following Expeditions, and many others, chose our equipment:

British Arctic Air Route Expedition.

Mount Everest Expeditions 1933, 1936, 1938.

British–Canadian Arctic Expedition 1936-39.

Falkland Islands Dependencies Survey 1943, 1944, 1945, 1946, 1947, 1948.

Norwegian–British–Swedish Antarctic Expedition 1949–50.

[Photograph by courtesy of Falkland Islands Dependencies Survey

Over 40 years' specialised experience in making tents and equipment of the highest quality have placed us in the forefront, where craftsmanship is of very great importance.

A copy of our general Camping Catalogue is available on request from Head Office.

CAMP & SPORTS (CAMTORS) LTD.

Head Office and Factory:
1-2 HARDWICK STREET
FINSBURY, LONDON, E.C.1
TERMINUS 4760

Showrooms:
16 BUCKINGHAM PALACE RD.
VICTORIA, LONDON, S.W.1
VICTORIA 4755

APPLICATION FOR ASSOCIATE MEMBERSHIP

Name_____

Date of Birth_____

School or University_____

Residence_____

being desirous of becoming an ASSOCIATE MEMBER of the ROYAL GEOGRAPHICAL SOCIETY, I the undersigned recommend _____ as a suitable candidate for election.

Dated this_____ day of _____ 19

_____ F.R.G.S., or University or School Authority.

IF ELECTED I wish to receive *GEOGRAPHICAL JOURNAL* *GEOGRAPHICAL MAGAZINE*

_____ Candidate

(*please indicate preference*)

GUARANTEE:

I accept full responsibility for any loss or damage incurred by the above candidate to books borrowed from the Library of the Royal Geographical Society.

_____ Parent or Guardian.

Received_____ Proposed_____ Elected_____

ROYAL GEOGRAPHICAL SOCIETY

NOTICES

Monday June 23 at 3 p.m.
ANNUAL GENERAL MEETING

Monday October 27 at 8.15 p.m.
THE NORWEGIAN–BRITISH–SWEDISH ANTARCTIC EXPEDITION *by John Giaever.*

PROPOSALS FOR ASSOCIATE MEMBERSHIP

The Associate Membership of the Society is open to those between the ages of 17 and 20. For its privileges see the back cover of the *Journal*, Applicants may be recommended by Fellows or by school or university authorities; a form of application is printed opposite. No entrance fee is payable by Associate Members and the annual subscription is £2; if they have paid three years' subscriptions they are eligible at the age of 21 for election to Fellowship without payment of the usual entrance fee.

THE SOCIETY'S HOUSE

The House of the Society is open from 9.30 a.m. to 5 p.m. on weekdays and from 9.30 a.m. to 1 p.m. only on Saturdays. The Library is also open for the exchange of books from 7.30 to 8 p.m. before Evening Meetings and until 5.30 p.m. before Film Meetings. Tea is served on weekdays in the new Tea Room or on the terrace.

The House will be closed on Monday August 4 for the August Bank Holiday.

By Order of the Council, L. P. KIRWAN, *Director and Secretary.*

PHYSICAL GEOGRAPHY

by

R. F. PEEL, M.B.E., M.A.

Professor of Geography, University of Leeds
(*Formerly Cambridge*)

10/6 net

(*Post free* **11/-**)

Distinguished

widely informed

scientifically clear

THE LATEST ADDITION TO THE SERIES PREPARED UNDER THE SPECIAL DIRECTION AND SCIENTIFIC EDITORSHIP OF PROF. FRANK DEBENHAM

Companion Volumes:—

THE USE OF GEOGRAPHY Frank Debenham	6/- net
ECONOMIC GEOGRAPHY W. S. Thatcher	6/- net
GEOGRAPHY OF LIVING THINGS M. S. Anderson	8/6 net

Pubished by:—

ENGLISH UNIVERSITIES PRESS LTD.

St. Paul's House Warwick Square London, E.C.4

SURVEYING INSTRUMENTS.

Luminous Prismatic Compass.
Steady dial floating in liquid.
Bearings can be read by day or night.
£11 10 0
In Leather Case.

J. H. STEWARD, LTD.
Scientific Instrument Makers
406 Strand, London, W.C.2
Established 1852

GLACIER CREAM

A protective cream for mountaineers, skiers and for those exposed to intense sunlight.

1 oz. tube 2/9 : 2 oz. tube 4/6
(postage 6d. extra)

SAVORY & MOORE LTD.
143 New Bond Street,
London, W.1

By Appointment Chemists To His late Majesty, King George VI.

ROBERT LAWRIE LTD.

Alpine and Polar Equipment Specialists

54, Seymour Street,
Marble Arch, London, W.1.
Telephone : Paddington 5252.
Telegraphic Address : Alpinist, Wesdo, London
Business Hours : Daily 9 a.m. — 6 p.m.
Sats. 9 a.m. — 12 noon.

CLIMBING & SKI-ING BOOTS
from stock or made to measure.

Accessory items of Clothing and Equipment :—Swiss and French Crampons, Ice Axes, Sleeping Bags, Rucksacks, Jackets, Socks and Stockings, etc.

Hand-sewn and machine-sewn repairs and re-nailings carried out to Climbing Boots.

Orders executed by Post.

Illustrated Catalogue not yet available, but Price List may be obtained on application.

Just Issued

CATALOGUE
OF
OLD & MODERN BOOKS
ON
SHIPS AND THE SEA
NAVAL HISTORY
YACHTING, Etc.

Free on request
FRANCIS EDWARDS LTD.,
83 Marylebone High St.,
London, W.1

PRACTICAL AND EXPERIMENTAL GEOGRAPHY

W. G. V. BALCHIN
Lecturer in Geography, King's College, London, and
A. W. R. RICHARDS
Senior Geography Master, Farnborough Grammar School, Hampshire

With a frontispiece and 73 line illustrations. 12s. 6d.

Advanced Geographies

New Volumes in the Press

GERMANY: Its Historical, Regional and Physical Geography by R. E. Dickinson. 42s.

INDIA AND PAKISTAN: A Social and Regional Geography by O. H. K. Spate 60s

MAPS AND DIAGRAMS by F. J. Monkhouse and H. R. Wilkinson 25s.

METHUEN & CO. LTD.
36, Essex Street, London, W.C.2

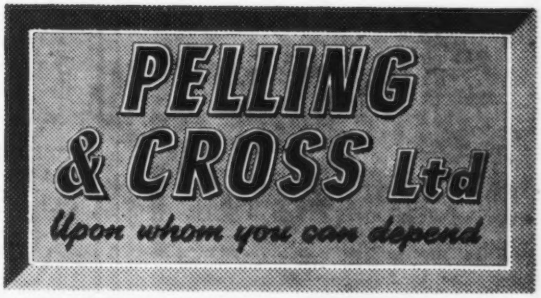
FOR PHOTOGRAPHIC AND CINE EQUIPMENT

our Showroom is a Pleasant Place

in which we exhibit, and demonstrate the fullest selection of Photographic and Cine Equipment. *Our customers enjoy the courteous and hospitable atmosphere of our Shop, where up-to-the-minute information on new products, and the benefit of comprehensive experience on old favourites is theirs for the asking. The choice of a Projector, Epidiascope or Enlarger naturally calls for actual proof of performance; therefore, our Theatre is available for immediate use, so that you may see, and hear any Equipment that you think will suit your purpose.*

Ask to see the astonishing
SPECTO 16 m/m ANALYTICAL PROJECTOR
giving two frames per second, dead stop and normal running by movement of one lever.

If further information is required on any of the above, or on any matter photographic, please call or write.



CALL AND SEE THESE FINE CAMERAS

MPP, Mark VI, 5"×4" Technical and Press Cameras; Rolleiflex; Reid; Wrayflex; Leica; Contax; Agiflex; and Microcord and other highly efficient lightweight Hand Cameras.

AND THE ARISTOCRATS OF THE CINE WORLD

Paillard-Bolex 16 m/m and 8 m/m Cameras; Bell & Howell Sound and Silent film Projector; Dekko & Specto 16 m/m and 8 m/m Silent projectors; Zeiss Moviscop Film Editors; 'Celfix' and 'Traveller' Screens.

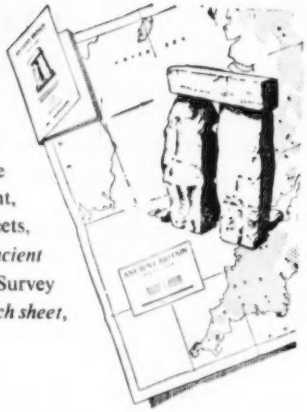
104 BAKER STREET, LONDON W.1
Phone: WELbeck 9682 and 1070

Ten Buses stop outside: Nos. 2-13-231-30-59-59a-74-113-153-159; and Baker Street Station is but 3 minutes' walk away

BW/6/52

A Thousand Ways to History

The history of pre-conquest Britain can be read in the many antiquities with which this island is strewn. In the new Ordnance Survey *Map of Ancient Britain* nearly a thousand antiquities of major significance are recorded and their precise positions fixed for the benefit of student, archaeologist and tourist alike. In two sheets, with foreword and index, the *Map of Ancient Britain* is available through Ordnance Survey Agents and most booksellers. *Price for each sheet, mounted and folded . . . 6s. 9d.*



O S

ORDNANCE SURVEY MAPS

Key to the land of Britain

PUBLISHED BY THE ORDNANCE SURVEY, CHESSINGTON, SURREY

Maps for educational purposes may be obtained direct from the Publishers at a special discount.

BY APPOINTMENT

CROSSE & BLACKWELL LTD

EXPLORERS, TRAVELLERS & DWELLERS OVERSEAS HAVE RELIED ON C&B FOODS FOR GENERATIONS . .

Makers and Preservers of fine Foods and Condiments for over 200 years.

CLARKSON'S

Secondhand Optical Stores.

338 HIGH HOLBORN, (Old) LONDON, W.C.1

Theodolites, Sextants, and other Surveying Instruments.
Telescopes, Prism Binoculars, &c.
By all the leading makers.

We supplied the Society with Prismatic Binoculars for the use of the Mount Everest Expedition.

DEATH ACCIDENT LIFE ANNUITY

INSURANCE

CONSULT

G.N.MARTIN

55 ROBIN HOOD WAY, S.W.15 (KINgston 3236)

J. D. POTTER, 145 Minories, LONDON, E.C.3

ADMIRALTY AGENT FOR CHARTS SINCE 1830

PUBLISHER OF NAUTICAL BOOKS AND BOOKSELLER

Complete stocks kept of all Admiralty Charts and other Hydrographic Publications. Publishers of the well-known navigational tables by Inman, Davis, Burdwood, Aquino, etc., Fowler's "Charts: their Use and Meaning," Harvey's "What Star is It?" Prince's "Seamanship as Applied to Towing," etc.

A large and comprehensive stock of TECHNICAL PUBLICATIONS of all descriptions is maintained at the above address. Lists of available books on any subject sent on request.

PARALLEL RULERS, DIVIDERS, PROTRACTORS, SCALES, SLIDE RULES, CANVAS CHART FOLIOS, Etc.

Telegrams: Potter, Minories, London. Telephone: ROYal 1369.

LI-LO

goes exploring!

Li-Lo Air Beds were used with great success by the recent Mount Everest Reconnaissance and are also being used by the British Himalayan Expedition 1952.
The leader of the Reconnaissance stated that they were used continually and stood up to very rough treatment.

* * *

Li-Lo products for beach, garden and camping are obtainable from all good class Stores, Sport shops, etc.

* * *

P. B. COW & COMPANY LTD., 12 HAY HILL, BERKELEY SQUARE, LONDON W.1

Advertisements :

All inquiries for Advertisement space in the Journal should be addressed to the Office of the Society.

Telephone: Kensington 2173

HEFFER'S

A CAMBRIDGE BOOKSHOP
THAT IS KNOWN
IN ALL PARTS
OF THE WORLD

◆

W. HEFFER & SONS, LTD.
PETTY CURY, CAMBRIDGE

Explorers...Writers...Photographers!

The NATIONAL GEOGRAPHIC MAGAZINE Invites You to Help Portray World Geography

YOUR narratives and human-interest photographs of travel adventure, everyday life in the area in which you live, or the geographic background of countries in the news may be ideal for publication in the NATIONAL GEOGRAPHIC MAGAZINE.

Millions of intelligent readers prize the beautifully illustrated NATIONAL GEOGRAPHIC as their most comprehensive source of timely information on the earth and its life. By becoming a contributor, you will gain the satisfaction of participating in the NATIONAL GEOGRAPHIC's world-wide educational work. You will also receive a liberal honorarium for all material accepted for publication.

You are urged to submit for editorial consideration an outline of the article you have in mind or your photographs in monochrome or natural color.

GILBERT GROSVENOR, Litt.D., LL.D., Editor

The NATIONAL GEOGRAPHIC MAGAZINE is the official journal of the National Geographic Society, a nonprofit educational organization founded in 1888 for "the increase and diffusion of geographic knowledge." It is read each month by two million member-families throughout the world. The Society's expeditions and staff, as well as the world's foremost explorers, travelers, artists, and photographers, bring firsthand information to The Magazine. Every year scores of articles, 750 pages of full-color illustrations, hundreds of monochrome pictures, and four ten-color wall maps make the NATIONAL GEOGRAPHIC an unparalleled record of our changing world.

The NATIONAL GEOGRAPHIC MAGAZINE, Washington, D. C.

THE SHOALS OF CAPRICORN

F. D. OMMANNEY

Author of "South Latitude"

"My choice as the best travel book since 'Kon-Tiki.'"—*The Tatler*

"Surrounds one with a feeling of space and scope and splendour"
—*Patrick Leigh Fermor, Sunday Times*

"Provides the two most attractive ingredients of a good travel book—genuine exploration and a sense of adventure"—*Observer*

"A record of the observations of a well-informed, acute and humorous mind upon one part of the earth's surface and its inhabitants. . . . It is clear that Dr. Ommanney is fascinated by the creatures of the ocean. It is one of his attributes that he can convey their beauty and strangeness to the reader"—*Birmingham Post*

Recommended by the Book Society *Illustrated, 21s. net*

LONGMANS

Russia and Her Colonies

A Study of Soviet Policy, by W. Kolarz

An exact and exhaustive account of the political treatment by the Soviet central government of the non-Russian peoples living in the U.S.S.R. From an unrivalled knowledge of the subject the author provides all the political, ethnic and economic information essential to a thorough understanding of the past and present relationships between Russia's 'colonies' and the Moscow Government. 340 pages with five maps and index. 8½ by 5½ inches

Boards, 25s net

Czechoslovakia

A Geographical and Historical Study, by Harriet Wanklyn (Mrs. J. A. Steers)

A book which contains a vast amount of detailed information unobtainable elsewhere. Much of the work was compiled in Czechoslovakia immediately before that country became a satellite of Russia. The sections on both Bohemia and Slovakia contain chapters on their history, climate, vegetation and soils, forests and forest industries, farming, industry and trade, communications, and population and settlement. 392 pages, with 26 pages of photographs and 38 pages of maps.
8½ by 5½ inches

Boards, 30s net

GEORGE PHILIP AND SON LIMITED

30–32 Fleet Street, London EC4

If you wish to escape to

WARM SUNSHINE THIS WINTER

EARLY BOOKING IS ESSENTIAL

Excellent opportunities for from 24 days from 50 gns. to 7 months 700 gns., independent and escorted.

TYPICAL ATTRACTIONS

Freighter round voyages to Algeria or Morocco 24/26 days, 50/60 gns.

Yugoslavia, C.E. & S. Med. Ports about 50 days for only 77 gns.

Mediterranean round voyages from and to Venice, inclusive cost from and to London 126/145 gns, 35 days.

165 days escorted World Tour, S. & E. Africa, Pakistan, India, Ceylon, Australia, New Zealand, first-class throughout, 733 gns.

A few Summer Sea Tours still available

Write for particulars

INFORMAL TRAVELS LTD

7 Pembridge Square, Bayswater, W.2

BAY 1592, 7302

Tirich Mir

the full story of

THE NORWEGIAN HIMALAYA EXPEDITION

The story of the first conquest of one of the world's highest and most inaccessible mountain peaks. Arne Naess and his companions made a dangerous, exciting and victorious journey to this giant Hindukush mountain, traversing unexplored valleys and abysses, ranges and glaciers only for bold climbers. They made discoveries of great value in scientific fields and took some highly interesting films of the Himalayan people. This is the complete and authentic account of their exploits.

47 pages of illustrations. 25s. *net.*

If you would be interested in our latest list of mountaineering books which includes works by Shipton, Smythe, Ruttledge and Somervell, please send a postcard to:—

The Publishers,
HODDER & STOUGHTON, 8/1 St. Paul's House, Warwick Square, London, E.C.4.

By Appointment to His late Majesty

Tent and Flag Makers King George VI.

BENJAMIN EDGINGTON

(SILVER & EDGINGTON, LTD.)

Makers of the finest
TENTS AND SLEEPING BAGS
in the world

Works:
Ruxley Corner, Sidcup, Kent
FOOtscray 6868

Showrooms:
69, Gt. Queen Street, Kingsway, W.C.2
HOL 6070

Suppliers to
Mount Everest Expeditions 1933/8. Himalayan Club 1951. Major Tilman's Central Nepal Expedition 1950. Empire Survey 1947/51. Falkland Island Dependencies 1943/8.

TENTS SLEEPING BAGS RUCKSACKS COOKING UTENSILS
CAMP FURNITURE BOOTS ROPE CLIMBING EQUIPMENT

The
GEOGRAPHICAL JOURNAL

Vol CXVIII Part 2 *June 1952*

EVEREST: THE 1951 RECONNAISSANCE OF THE SOUTHERN ROUTE

ERIC SHIPTON

WHEN IN 1924 Norton and Somervill so nearly reached the summit of Mount Everest, it was generally believed that the next expedition, taking advantage of the lessons they had learned, would most probably succeed. For, just as the 1922 parties in attempting to climb the last 4000 feet to the top in a single day had completely underestimated the physiological difficulties of climbing at great altitudes, so it seemed that the failure of the 1924 expedition was due to a simple, avoidable cause. That year the climbers had gone high too soon and had become involved in struggles with the early spring blizzards, which had so far drained their strength that when the time came to launch their attempts upon the summit the climbers were already exhausted. In 1933 we were confident that by carefully nursing the climbers, and the Sherpas chosen to go high, through the preliminary stages and by the use of comfortable, double-skinned tents at Camps III and IV, it would be possible to place several successive parties at a camp above 27,000 feet with their reserves of strength largely unimpaired, and well able to overcome the last 2000 feet.

Once again we found that we had underrated the resources of our opponent. We had been led by the experiences of the previous expedition to assume that at the end of May and beginning of June there would be a period of some two weeks of calm weather before the monsoon wrapped the mountain in a blanket of snow. Moreover, we had not fully realized the extent to which even a small deposit of new snow upon the rocks of the final pyramid would render them unclimbable. Our experiences in the nineteen thirties showed all too clearly that such a spell of favourable conditions immediately before the monsoon could not be relied upon. Indeed, it did not occur in any of the three years when attempts were made during that decade. In 1933 we had perhaps a fleeting chance; but both in 1936 and 1938 the monsoon was upon us before we had even established a camp on the North Col.

Even now we cannot assess the chances in any given year of meeting with a sufficiently late—or as we used to think, "normal"—monsoon to ensure favourable conditions for reaching the top. We cannot say from the evidence we have, whether 1924 was an exceptional year, recurring perhaps only once or twice in a generation, or whether in the nineteen thirties we perhaps

encountered a limited cycle of unfavourable seasons. Whatever the answer, it seemed that the problem of reaching the summit of Mount Everest from the north had been reduced to this one vital question. Three times men had climbed to more than 28,000 feet, unaided by oxygen apparatus; we believed that the climbing on the last 1000 feet was no more difficult than that which had already been accomplished, but sufficiently difficult to demand good conditions of weather and snow; given these there seemed to be no reason for failure, without them success would not be attained. Had it been possible, the obvious solution would have been to send out a small party each successive year until the right conditions occurred. There would have been no lack of personnel, and the modest expense would have been amply justified by physiological and other scientific research. Unfortunately permission to do this could not be obtained from the Tibetan Government.

The attempt to climb Mount Everest, once an inspiring adventure, had become little more than a gambler's throw. To overcome this unhappy situation we had begun, as long ago as 1935, to consider the possibility of finding an alternative approach which would present a different kind of problem, one not so completely dependent for success upon the date of the monsoon.

From the mountains above the Kangshung Glacier, to the south-east, we had seen the ridge running up to the summit from the gap (the "South Col") between Everest and Lhotse. This clearly offered a much easier route up the final pyramid than that across the treacherous slabs of the North Face. It was broad and not so steep, while the dip of the strata would favour the climber. But was there any way of reaching the South Col? We had seen that the eastern side was impossible. The western side of the Col was unknown ground.

The Reconnaissance Expedition of 1921 had discovered in broad outline the geography of the south-western side of Mount Everest. The three great peaks of the massif, Everest, Lhotse (South Peak) and Nuptse (West Peak,) together with their high connecting ridges, enclosed a basin which Mallory named the West Cwm. (Mallory had climbed a great deal in North Wales and for that reason he used the Welsh spelling of the word "combe".) Any approach to the South Col must lie up this hidden valley, which enclosed the whole of the southern aspect of Mount Everest.

On the 1935 Reconnaissance Expedition, when with no intention of attempting to climb Everest we had before us a wide field of mountain travel, our programme included an attempt to find a way to the West Cwm from the north. From the Lho La at the head of the Rongbuk Glacier, and also from a high col on the main watershed farther to the west, where we camped for two nights, we had close views of the entrance to the Cwm, a narrow defile flanked on the south by the great north face of Nuptse and on the north by the western shoulder of Everest. Between these lofty portals the glacier of the Cwm poured in a huge ice-fall, a wild cascade of ice blocks, 2000 feet high. The upper part of the Cwm was screened from view by a northerly bend in the valley, so that we could not see either the South Col or the south face of Everest; nor could we find a practicable route down the precipices on the southern side of the watershed which would have enabled us to reach the foot of the ice-fall.

THE ENGLISH PLACE-NAME SOCIETY

President: Sir Frank M. Stenton

THE English Place-Name Society, founded in 1923, is carrying out a survey of all the place-names in England, county by county. Its work has the approval and support of the British Academy; it attempts to trace the origin and development of place-names. It publishes the result in county volumes which deal not only with major names (of regions, rivers and towns) but also with the names of every village and hamlet and with many farm and field-names, some of which are of great antiquity. The history of street-names in towns is also included. Each volume contains an Introduction, discussing the different languages (Celtic, Anglo-Saxon, Norse, Danish and French) which are involved, and indicating the conclusions which may be drawn therefrom concerning the history of the region.

The Society depends for its existence upon the support of the general public whose annual subscriptions finance its publications and the original research upon which they are based. In return for their support members receive a volume a year. During the war, publication was necessarily halted, but it has now been resumed, and the Society is therefore able to offer all new members now joining an immediate return for their subscriptions. New members are offered the choice of receiving either the volume for the current year, when it becomes available, or, if they prefer it, any one of the previous volumes published of which a stock is available. (A list of these is given overleaf.)

A very few sets, complete but for the volume on *Elements*, which is being drastically revised, are available.

The annual subscription is 15 shillings. The Society invites you to become a member now, by filling up the form overleaf and sending it to the Director of the English Place-Name Society, University College, London, W.C. 1.

Members of the Society may obtain any of the volumes mentioned overleaf on payment of a subscription for the year for which they were issued.

All these are published for the Society by the Cambridge University Press.

Volumes now in preparation deal with the counties of Berkshire, Derbyshire, Gloucestershire, Leicestershire, Norfolk, Oxfordshire, Rutland, Somerset, Suffolk and the West Riding of Yorkshire.

BACK VOLUMES AVAILABLE TO NEW MEMBERS IN 1952-53

Vol. II	*The Place-Names of Buckinghamshire*, by A. Mawer and F. M. Stenton, 1925.
Vols. VI and VII	*The Place-Names of Sussex*, parts 1 and 2, by A. Mawer and F. M. Stenton, with the assistance of J. E. B. Gover, 1929, 1930.
Vols. VIII and IX	*The Place-Names of Devon*, parts 1 and 2, by J. E. B. Gover, A. Mawer and F. M. Stenton, 1931, 1932.
Vol. X	*The Place-Names of Northamptonshire*, by J. E. B. Gover, A. Mawer and F. M. Stenton, 1933.
Vol. XI	*The Place-Names of Surrey*, by J. E. B. Gover, A. Mawer and F. M. Stenton, in collaboration with Arthur Bonner, 1934.
Vol. XII	*The Place-Names of Essex*, by P. H. Reaney, 1935.
Vol. XIII	*The Place-Names of Warwickshire*, by J. E. B. Gover, A. Mawer and F. M. Stenton, in collaboration with F. T. S. Houghton, 1936.
Vol. XIV	*The Place-Names of the East Riding of Yorkshire and York*, by A. H. Smith, 1937.
Vol. XV	*The Place-Names of Hertfordshire*, by J. E. B. Gover, A. Mawer and F. M. Stenton, 1938.
Vol. XVI	*The Place-Names of Wiltshire*, by J. E. B. Gover, A. Mawer and F. M. Stenton, 1939.
Vol. XVII	*The Place-Names of Nottinghamshire*, by J. E. B. Gover, A. Mawer and F. M. Stenton, 1940.
Vol. XVIII	*The Place-Names of Middlesex*, by J. E. B. Gover, A. Mawer and F. M. Stenton, with the collaboration of S. J. Madge, 1942, for the subscription for 1941.
Vol. XIX	*The Place-Names of Cambridgeshire and the Isle of Ely*, by P. H. Reaney, 1943, for the subscription for 1942.
Vols. XX and XXI	*The Place-Names of Cumberland*, by A. M. Armstrong, A. Mawer, F. M. Stenton and Bruce Dickins, 1950, for the subscriptions for 1943 and 1944.

To the Director of the English Place-Name Society (Professor A. H. Smith), University College, London, W.C. 1, England.

I wish to become a member of the English Place-Name Society. I enclose a cheque* for fifteen shillings, 2 dollars 25 cents being my subscription for 1952–53.

Please send me†

(1) The volume for the current year, when it becomes available.

(2) The volume for the year 19 .

NAME

ADDRESS

Date

* Payable to the English Place-Name Society.

† Strike out whichever you do NOT want.

J.B.Ltd. 520579

Thus the possibility of finding an alternative route up Mount Everest from the south-west could not be put to the test, for the only way of approaching the mountain from that side was through the valleys of Solu Khombu in Nepal. That country had long been forbidden to Western travellers and there was, in those days, no chance of obtaining permission from the Government of Nepal to send an expedition to that area. Since the war however the Nepalese Government began to relax their policy of rigid exclusion, and from 1947 onwards several mountaineering and scientific expeditions, American, French and British, were permitted to visit various parts of the Nepal Himalaya. In the autumn of 1950, Dr. Charles Houston and his father, together with H. W. Tilman, paid a brief visit to the upper valleys of the Khombu district.[1] Houston and Tilman spent a day exploring the glacier flowing southward from the Lho La, but did not have time to reach the ice-fall.

In May 1951, Michael Ward proposed to the Himalayan Committee—the Joint Committee of the Royal Geographical Society and the Alpine Club which has organized all previous Everest Expeditions—that permission should be sought for a British expedition to go to Everest that autumn. His suggestion was energetically supported by Campbell Secord and W. H. Murray, formal permission was applied for and, on the assumption that it would be forthcoming, Murray began the preliminary work of organizing the expedition. I was in China at the time, and when I arrived home in the middle of June I had no idea of what was afoot; indeed nothing was further from my thoughts than taking part in a Himalayan expedition.

When it was suggested that I should be the leader, I did not at first take the suggestion very seriously for it seemed unlikely that permission for an expedition would be forthcoming. But within a few days it was learnt that, through the courtesy of the Nepalese Government and the good offices of Mr. (now Sir Christopher) Summerhayes, the British Ambassador at Katmandu, permission for the expedition had been granted.

The temptation to accept the Himalayan Committee's invitation was strong. For twenty years, ever since I had first known the Sherpas, I had longed, above all else, to visit their land of Solu Khombu through which the expedition would travel. I had heard so much about it from the Sherpas; for, during our journeys together in other parts of the Himalaya and Central Asia, whenever we came upon a particularly attractive spot, they invariably said "This is just like Solu Khombu," and the comparison always led to a long, nostalgic discourse about their homeland. It required only an intelligent glance at the map and a little imagination to realize that their praise was not exaggerated. We had looked down into the upper valleys of Khombu from the peaks west of Everest. Almost unknown to Western travellers, it had become, to me at least, a kind of Mecca, an ultimate goal in Himalayan exploration.

All that we knew of the South Face of Mount Everest and of the western side of the South Col was that they must be approached up a formidable ice-fall and through a narrow defile which was probably menaced by ice

[1] H. W. Tilman, "Explorations in the Nepal Himalayas," *Geogr. J.* 117 (1951) 263–74.

avalanches from the hanging glaciers on the immense precipices above. Beyond the defile was the unknown Cwm, whose southern containing wall, the 25,000-foot ridge connecting Lhotse with Nuptse, obscured all but the very summit of Everest from the south. We estimated that the floor of the Cwm was about 21,000 feet high, nearly 5000 feet below the crest of the South Col. From the fact that, along the whole range, the mountains were far steeper on the southern side of the watershed than on the northern side, we inferred that the slopes below the col would not be easy. That was all we could guess. It did not present a picture upon which we could build great hopes. But the West Cwm was a freak of mountain architecture and there was no knowing what we might find there. I put the chances against our finding a practicable route at about thirty to one.

Clearly the expedition would only be a reconnaissance, moreover the time and money at our disposal were not sufficient to organize an attempt to climb the mountain. If, despite the long odds, we found a possible route, we naturally hoped to send a further expedition the following spring to attempt it; for we still believed that, despite its many disadvantages, the spring was the only time of year to tackle the mountain. A case had been argued for making the attempt in the late autumn; that is, after the monsoon instead of before it. So far as I know, this idea had not gained the support of anyone who had been high on the mountain, but it had never been put to a practical test. There were conflicting theories about the weather and snow conditions likely to be encountered in the autumn: there was little evidence on which to base these theories and what evidence there was seemed equally conflicting. By visiting the mountain after the monsoon we hoped to furnish answers to some of these questions.

The party originally comprised Bill Murray, Michael Ward, Tom Bourdillon and Alfred Tissières, one of the best known Swiss climbers, who happened to be doing research work in Cambridge at the time. It was also hoped that Campbell Secord would be able to join the party. Unfortunately, in the end, neither Tissières nor Secord was able to accompany the expedition. Murray and Ward sailed from Tilbury on 2 August 1951, taking with them all the stores and equipment. They reached Bombay on August 18. Bourdillon and I flew to Delhi arriving there on August 19. Two days before I left London a cable was received from the President of the New Zealand Alpine Club asking whether two members of the New Zealand Expedition which was climbing in the Garhwal Himalaya that summer, might accompany our party. I also received a request from the Geological Survey of India to attach one of their officers, Dr. Dutt, to the expedition. I welcomed these suggestions.

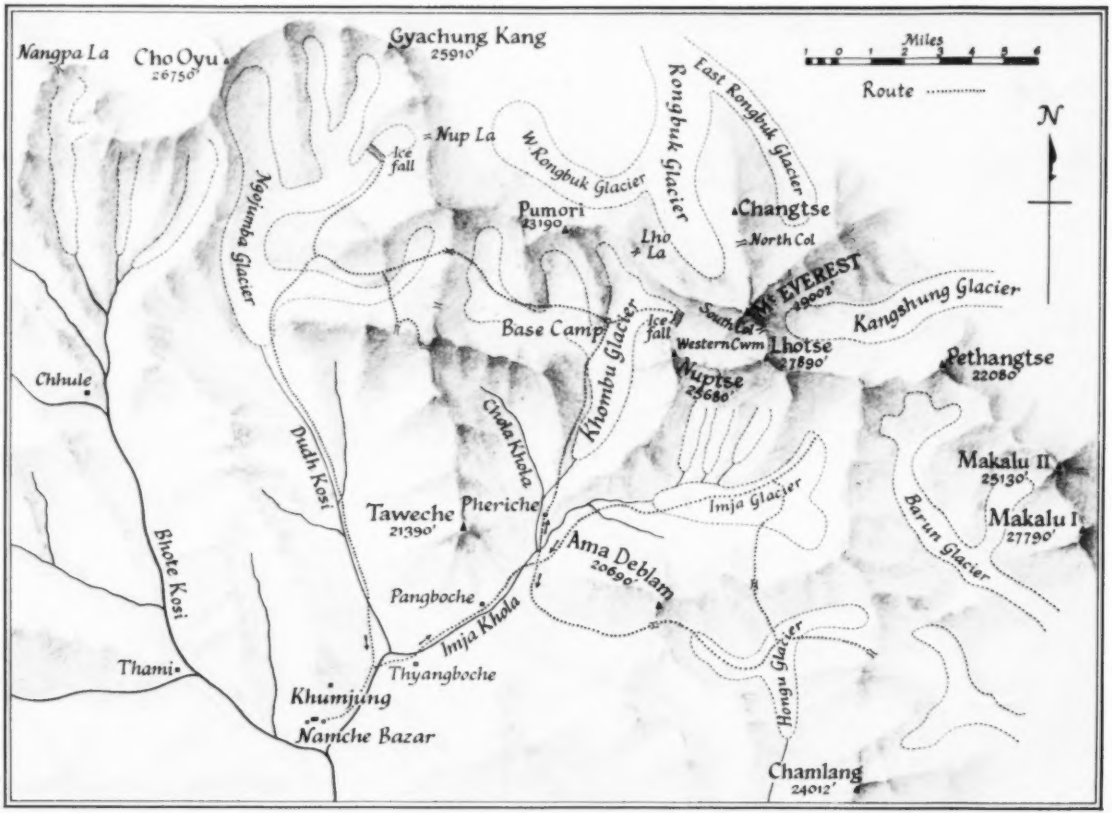
The march

From India there are four ways of reaching Namche Bazar, the principal village in the district of Khombu, where we proposed to make our base. The route from Darjeeling, generally used by the Sherpas, is long and very difficult during the monsoon. The route from Katmandu though easier is also rather long, while the cost in time and money of transporting a large quantity of baggage from India to the Nepalese capital is considerable. By far the quickest

Ice-fall leading into the West Cwm

Phot. Copyright Himalayan Committee

Panorama from the shoulder of Pumori


Nangpa La
Cho Oyu
26750'
Gyachung Kang
25910'
Miles
Route
N
Nup La
Ice fall
W Rongbuk Glacier
Rongbuk Glacier
East Rongbuk Glacier
Ngojumba Glacier
Pumori
23190'
Changtse
North Col
Lho La
Mt EVEREST
29002'
Kangshung Glacier
Base Camp
Ice fall
South Col
Western Cwm
Lhotse
27890'
Nuptse
25680'
Khombu Glacier
Pethangtse
22080'
Chhule
Dudh Kosi
Gyoda Khola
Makalu II
25130'
Taweche
21390'
Pheriche
Imja Glacier
Makalu I
27790'
Barun Glacier
Ama Deblam
20690'
Bhote Kosi
Pangboche
Imja Khola
Thami
Thyangboche
Khumjung
Namche Bazar
Hongu Glacier
Chamlang
24012'

way would be from Jaynagar, the railhead north of Darbhanga in Bihar. But we were advised that it would be impossible to get from there to the foothills by lorry during the rains, while to march through the hot, swampy country would be most unpleasant. So we decided to travel from Jogbani, another railhead in north Bihar farther to the east. Houston's party had gone by this route the previous year, after the monsoon was over, and they had succeeded in reaching Namche in a fortnight from Jogbani.

Bourdillon and I reached Jogbani shortly before midnight on August 24 and we were met at the station by a jeep belonging to the Biratnagar Jute Mills. It was raining hard, and judging by the sodden state of the ground all round the little station it seemed that it had been doing so for weeks. The road was so deep in mud that it took an hour to go from the station to the house of Mr. Law, the Chief Engineer of the Jute Mills, less than a mile away. This journey took us across the frontier into Nepalese territory. Mr. and Mrs. Law and Murray and Ward, who had arrived two days before, were waiting for us and we were given a wonderful welcome in this Scottish home. The following day Colonel Proud, First Secretary of the British Embassy at Katmandu, arrived. He had been sent by the Ambassador to assist us and to accompany us as far as Dhankuta. His help was invaluable. He had brought with him Lieutenant Chandra Bahadur, an officer of the Nepalese Army, whose services had kindly been lent to the expedition.

On August 25, too, Angtarkay arrived from Darjeeling. He is a very old friend of mine. We had been together on eight Himalayan expeditions before the war, and I had always regarded him as a man of quite outstanding character and ability. During the past few years he had set up a business in Darjeeling organizing treks in Sikkim for visitors. But he still went with major expeditions, though now as a Sirdar, or foreman. He was on the French expedition to Annapurna in 1950, and climbed to their highest camp. I had asked him to meet us in Jogbani to help with the transport to Namche, and later for work on the mountain. I had not seen him since 1939 when he was just a simple Sherpa porter, though a famous one, drawing the same pay as the others and carrying the same load. Now he had graduated to a different sphere. I was somewhat apprehensive of what I would find: for success tends to spoil these simple people at least as readily as it does the sophisticated. He had cut off the handsome pigtail that he used to wear and his clothes were distressingly smart, but I was relieved to find the same shy reticence and the same quiet humour that I remembered so well. There was no sign of dissipation and he looked no older: indeed he had changed remarkably little in the last twelve years. It was curious that, in spite of his constant contact with Europeans, he had learnt practically no English.

Angtarkay had brought with him from Darjeeling twelve Sherpas including a woman. They were all on their way to Solu Khombu and were hoping to "work their passages" with us. We signed on four of them for the duration of the expedition and agreed to employ the others for the march at the same rates of pay as we gave to the local porters.

The next stage of our journey was a lorry drive of 30 miles to Dharan at the foot of the hills. We were told that with all the rain then falling the road would be impassable, and that we would have to wait until the weather

cleared. This was depressing news for there seemed to be no reason why it should ever stop raining. However, Mr. Law assured us that it would. In the meantime we were busy sorting out stores and equipment and packing them into 60-lb. loads for the march.

On the evening of August 26 it stopped raining and on the following morning a watery sun shone through the clouds. We set out in our hired

The march through Nepal

lorry at 2.30 that afternoon. At Biratnagar, two miles away, there was an hour's delay while the driver collected supplies of petrol and tinkered with the engine. The lorry was besieged by people wanting a lift to Dharan and by the time we left it was grossly overloaded. The road was in a deplorable state. Every few hundred yards the vehicle was brought to a standstill in deep mud and each time we had first to dig trenches to free the wheels and then to spread bundles of grass and jute husks over the mud. It took us more than two hours to cover the first six miles. However, though it started to rain

heavily again, conditions improved as we approached the hills. We reached Dharan long after dark, found a billet in an empty house and, after a long search, procured a meal in the bazaar.

The next morning we recruited coolies for the first part of the march. We found that the local practice was to pay coolies so much per seer (2 lb.) per stage. The men therefore preferred to carry 80-lb. loads instead of 60 lb., and we had to set about rearranging all our carefully packed baggage. While we were doing this a small boy came and asked if he could be signed on as "half a coolie." This tickled the Sherpas, and we gave him a box weighing 40 lb. He carried it so well that later I came to regret that all our team of porters were not small boys.

These matters occupied the whole of the morning and it was 2 o'clock in the afternoon before we began the first march. In a couple of miles we reached the foot of the mountains. Here, as elsewhere throughout the length of the Himalayas, they rose abruptly from the plains for about 5000 feet to the crest of the first range of foothills. We walked with our umbrellas up, for the sun was shining at last and it was very hot; but after a couple of hours we had climbed into low hanging clouds where the air was deliciously cool and fresh. We spent the night in a small village just below the crest of the first range. It rained heavily all night, but at dawn on August 29 it had cleared somewhat, and as we crossed the ridge we had a glimpse of the Everest and Makalu massifs, 75 miles to the north shining through a rift in the rain clouds. From the pass we descended 3500 feet to the Tamur River and then climbed a similar height up the other side of the valley to Dhankuta, where we were provided with a tiny rest house in a pleasant wood of tall pine trees. The following morning Colonel Proud started back on his return journey to Jogbani and thence to Katmandu.

Though we had covered a considerable distance, those first two marches had been very easy. The path was wide and well constructed, the porters had gone well and it had not rained at all during the day. So far we had experienced nothing of the exasperation, the dismal toil of travel through the Himalayan foothills at the height of the monsoon. We soon began to suspect that it was not all going to be so easy. We had hoped that we would be able to persuade the Dharan coolies to remain with us, so that we could continue the march the very next day; but they refused and insisted on being paid off. What was worse, we had the very greatest difficulty in finding any fresh recruits. We sent the Sherpas into the bazaar and the Bara Hakim (the local governor) sent peons into the outlying villages to engage men. A few men arrived and agreed to go with us; but finding that we were not ready to start they drifted off again and disappeared. When this happened several times the situation began to seem desperate. By the time we had been in Dhankuta for forty-eight hours we felt as though we would never be on our way again. Various plausible explanations were advanced by the local authorities for the lack of coolies; none of them suggested a solution; a large military camp had been established nearby, and all the coolies were required to work there; owing to the recent disturbances in the country the peasants were frightened to go far from their villages; because of the lateness of the rains, work on the land had fallen into arrears with the result

that the demand for labour was unusually heavy; no one ever travelled far during the monsoon if he could help it. Looking back I would say that the last was the most likely explanation. We could get curiously little information about the route ahead, and none that was reliable. We decided that a place called Dingla was to be our next objective. The country beyond that was, locally, a mere legend. Each person we asked held a different opinion as to how we should get to Dingla; while estimates of the time it would take varied between one day and a week.

It is remarkable how, when the situation seems hopeless, a solution presents itself. At about noon on September 1 we suddenly found that there were no fewer than seventeen coolies who were willing, though somewhat half-heartedly, to talk business. We required twenty-five; but Angtarkay urged that we should start at once with these before they had time to change their minds, and that he should follow with the remaining eight when he could get them. I was reluctant to split the party at such an early stage, but it was obviously the wisest course to follow. Furthermore the news that the expedition had moved on would certainly have a quick psychological effect upon the local carriers, who would immediately begin to think that they were missing a good thing.

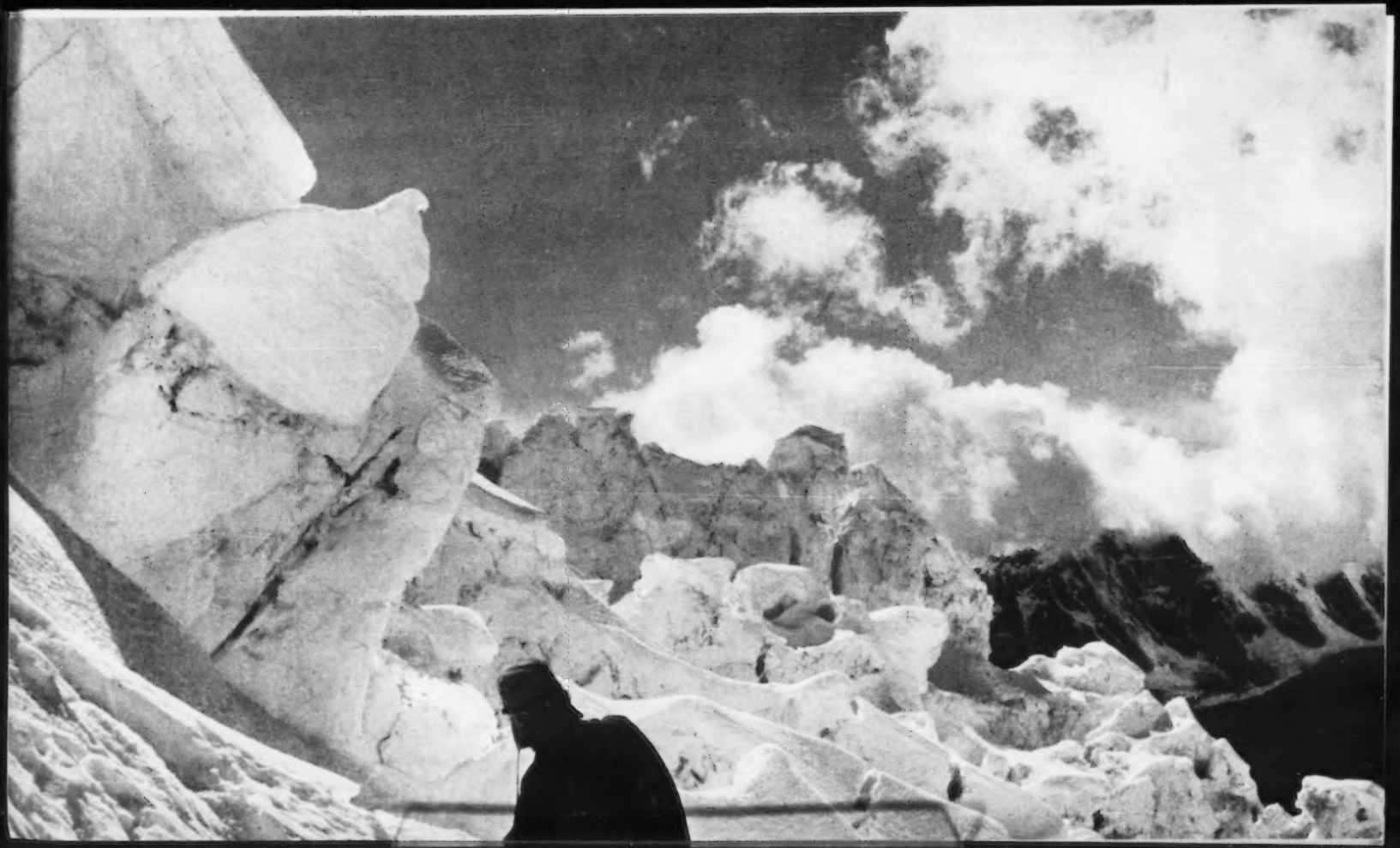
Before starting we went to say goodbye to the Bara Hakim and to thank him for his help and hospitality. He had just received a message from Jogbani to say that the two New Zealanders who were to join the expedition, E. P. Hillary and H. E. Riddiford, had arrived there. This was good news for until then we had had no word of their whereabouts; we sent messages back to them and started on our way. In the evening we reached a ridge, some 6000 feet high, overlooking the vast basin of the Arun River, where we spent the night in the little village of Pairibas. Angtarkay arrived early the following morning. As we had expected, he had found no difficulty, once we had gone, in recruiting the remaining eight porters. Our march that day took us 5000 feet down to the banks of the Arun.

At dawn on September 3 we walked along a wide shore to a place called Legua Ghat where there is a primitive ferry. A light mist hung low over the great river; this began to disperse as soon as the sun was up and we saw far away up the valley the gleam of snow peaks. The ferry consisted of a tree trunk hollowed out to make a clumsy canoe. It had a crew of three, two paddlers forward and a steersman aft, and could take seven passengers at one time, or an equivalent weight of baggage. As soon as the boat was cast off from the bank it was swept down by the current at an alarming speed. The paddlers worked furiously to get their frail craft across the river with a minimum loss of distance; for after each crossing it had to be towed laboriously back along the shore. The river was about 300 yards wide and though there were no rapids for a mile or so downstream, which allowed a substantial margin of error, the operation required considerable skill. It took from 7 a.m. until 2 p.m. to complete the ten double crossings necessary to transport ourselves, our coolies and our baggage across the river.

We were now less than 1000 feet above sea-level, and when we resumed the march that afternoon the heat was intense. There was no clearly defined route across the vast forested slopes of the valley. We made our way through

Hillary pauses for breath on the ice-fall

Phot. Copyright Himalayan Committee



The monastery at Thyangboche

Phots. Copyright Himalayan Committee

Standing: Shipton, Murray, Bourdillon, Riddiford; seated: Ward, Hillary

The Nangpa La (19,050 feet)

Phots. Copyright Himalayan Committee

Stratified glacier ice in the Hongu basin; the peak behind is unnamed

The village of Thami above the Bhote Kosi, peaks of the Kangteke group in the distance

Phots. Copyright Himalayan Committee

Ward standing beside the line of tracks

steep rocky nullahs along a series of tiny tracks which, branching and intersecting, connect the scattered hamlets. Often the tracks were so obscure that we lost them. The porters, carrying 80-lb. loads, went very slowly; even so their speeds varied a great deal and it was impossible to keep them together and, with such a diversity of tracks, we soon lost contact with some sections of the party. At nightfall on September 3 we reached a hamlet called Komaltar. Though it was only 4½ miles in a direct line from the ferry, it had taken nearly five hours to cover that distance. Nine of the local porters bivouacked in a stream-bed half a mile short of the hamlet and came in early next morning. The rest failed to turn up, and after sending back in search of them without success, we concluded that they had taken a different route. They reached Dingla more than a day after us.

For 7 or 8 miles we kept fairly close to the banks of the Arun, sometimes following a stretch of shore. The tropical forest and the dense undergrowth, the birds, the brilliantly coloured locusts, butterflies and other insects were typical of the deep river valleys of the eastern Himalaya. We wore only shorts and sand-shoes, with umbrellas to protect our heads from the heat. Whenever we came to a safe breakwater, we used to plunge straight in and sit down for a few moments. The water was deliciously cool, though the refreshing effect did not last long. Even the Sherpas who are afraid of water, and who normally never immerse their bodies, began, at first timidly then with great zest, to follow suit: all except poor Lhakpa, the woman, who looked on with obvious envy.

On the afternoon of September 4 we climbed 3000 feet up through lovely country to a cluster of villages called Phalikot, and next day a relatively short march took us to Dingla, a large scattered village perched among woods and terraced fields on a high ridge which commanded sweeping views across the Arun basin and, when the weather was clear, of the great snow ranges to the north.

At Dingla we again had great difficulty in recruiting porters. The Dhankuta men had been engaged as far as Dingla and refused to go any farther. We were delayed for four days. On September 8 Hillary and Riddiford arrived. We now required forty local coolies for, besides the baggage brought by the New Zealanders, we had bought a quantity of rice and flour in case of a possible shortage in the country beyond. At last, on the evening of September 9, after long and exasperating negotiations, enough men had been engaged. We gave them an advance of pay, and they promised to be ready to start soon after dawn the next day. But the next morning it was raining very heavily and they did not come until noon. However, after a couple of hours of tumult and confusion we managed to allot them their loads and get them off.

Our next objective was the Salpa Bhanjyang, a 12,000-foot pass to the north-west leading over from the Arun basin to that of the Hongu Khola. The direct route was impassable owing to some steep mountain streams which were in spate and had swept away the bridges crossing them. This meant that we had to make a long detour to the south-west so as to reach the crest of the high watershed ridge, which we then followed to the pass. The detour cost us several extra days marching. It was particularly annoying

to discover that, if we had known this before, we could have reached the ridge much more quickly by travelling direct to it from Dhankuta via Bhojpur.

On September 10 we made our way along the path leading towards Bhojpur. This was easy and fairly level but we had started so late, and the porters went so slowly, that by nightfall we had only reached the village of Phaldobala 4 miles away. The next morning the porters refused to go on, saying that their loads were too heavy. According to the local custom we had contracted to pay them by weight and for this reason they had in the first place chosen to carry 80 lb. each rather than 60 lb. This meant that we had once again to rearrange all the loads and also to recruit more porters to carry the surplus. These operations, made no easier by the rain, occupied the whole of that day.

On the march to Dingla it had rained mostly at night and the days had been fine. This happy arrangement could not be expected to last and by now it was raining for most of each day. We set off again on the morning of September 12 and climbed to the crest of the high, narrow watershed ridge. For three days we made our way slowly along it in a northerly direction, unable to see anything of our surroundings because of alternating spells of heavy rain and equally drenching Scotch mist. After a while we lost all sense of direction and distance; it was a curious sensation, blindly following this narrow crest, the ground on either hand falling steeply into the silent, forested depths below, while rocky peaks loomed, one after another, ahead. The undergrowth was infested with leeches; on a single twig a score of the creatures could be seen, stiff and erect, like a cluster of little black sticks, ready to attach themselves to our legs and arms and clothing as we brushed past.

The way consisted of a continuous series of long, steep climbs and descents. It was very hard work for the porters for the track was slimy with mud and they slipped constantly, losing their balance under the shifting weight of their sodden loads. We spent the nights in little cowherd's shelters, mostly deserted, which were interspersed along the ridge. They kept out most of the rain, and fires lit inside discouraged the leaches from entering. Without them our lot would have been a great deal worse. One evening at sunset the mists slid down below the ridge, and for a while we saw, across a wide gulf of cloud, the great range of ice peaks.

At the Salpa Bhanjyang, which we reached on the morning of September 15, we joined the route used by the Sherpas travelling between Khombu and Darjeeling. Angtarkay told me that when he was last there, in December 1947, it was so deep in snow that he had taken three days to cross it and that several Sherpas had died attempting to do so. It was a great help at last to have someone in the party who knew the way. From the pass we descended steeply for 7000 feet to the Hongu Khola. At the village of Bung on the farther side of the valley we heard that the bridge across the next big river, the Inukhu Khola, had been washed away, and we had to choose between making a detour of three days to the south, or attempting to build another bridge ourselves. We decided on the latter alternative.

From Bung we crossed another pass, about 10,600 feet high to Khiraunle which stands about 1000 feet above the Inukhu Khola. Here we were told that several villages in the neighbourhood had been smitten by an epidemic of

some virulent disease which killed its victims in four days. From a description of the symptoms it seemed probable that it was bubonic plague. There was a village straight across the valley where fifty people had died during the past fortnight. The intervening gorge was so narrow that, though the place was the best part of a day's march away, we could with the naked eye see people moving about in it. We studied their movements with field glasses and saw that they were engaged in some activity which the Sherpas declared was a burial ceremony.

But the village of Khiraunle also provided some less depressing news. The local people were engaged in building a temporary bridge across the Inukhu Khola to take the place of the one that had been washed away, and this would be ready early the following morning. That day was the worst of the march. Heavy rain fell almost continuously. A way had to be cut through the dense undergrowth to enable the porters to climb down the precipitous slopes of the gorge to the point where the new bridge was built. This was only a few hundred yards downstream from the old bridge, but the intervening distance was impassable along the river bed. The new structure was a very flimsy affair, built in two sections, each spanning a formidable cataract and connecting one bank of the river with a central island. Each section was composed of two slender tree trunks lashed together with green bark, and a bamboo handrail that would not have withstood a pressure of ten pounds. The river was rising rapidly and before everyone was across waves were splashing over the logs. Not long afterwards both sections of the bridge were swept away, leaving the bamboo handrails flapping crazily in the spray.

We then had to climb a steep cliff to regain the track. In doing this we disturbed a hornets' nest. Not having been attacked myself I was mystified by the ensuing confusion and panic until the party had re-assembled on the track, 300 feet above the river. Two of the coolies had been stung so severely (one claimed seven stings) that they were already suffering from acute fever. Several others had swollen faces and eyes, while one man had disappeared. His load was located near the hornets' nest and we thought that he had fallen down the cliff in his attempt to escape. I sent Angtarkay on to a village 2000 feet above to get help, while Bourdillon, Ward and I climbed down the cliffs again and searched along the shore for the missing man, expecting to find his broken corpse. He had not however fallen and eventually he was found in a high fever sheltering in a cave. All the victims of this curious encounter recovered overnight.

The next day, September 19, we crossed another 10,000-foot pass which took us into the valley of the Dudh Kosi. On the evening of September 20 the weather suddenly cleared and the monsoon seemed to have ended. After ten days of perpetual rain and mist the clear air and warm sunlight were delicious. The forest was no longer oppressive but light and green; the waterfalls sparkled as they cascaded down the huge precipices flanking the wide valley, threads of silver hanging from the ice spires 12,000 feet above our heads.

We were now in the country of the Sherpas, and a form of "Channel fever" animated Angtarkay and his companions. At each village through which we passed they were greeted by a crowd of their friends who took

them off to some house to be fed and wined to the accompaniment of eager chatter and full-blooded laughter. Of course we came in for our share of this hospitality, which doubtless contributed to the magic of the scene. I began to wonder if, when eventually we reached our objective, any of us would be in a fit state to climb.

The valley split into two narrow gorges. The path, by a remarkable series of log platforms and ladders built in the cliff, followed the right-hand branch for half a mile, the lovely snow peak of Taweche framed between the vertical sides of the canyon, then climbed, zig-zag, for 2000 feet to the intervening ridge. Here, in a little fold in the mountainside, was Namche Bazar 12,200 feet above sea-level. We arrived there in the afternoon of September 22; the journey from Jogbani which we had expected to cover in a fortnight had taken us nearly four weeks.

Namche Bazar, which consists of about sixty houses, is the most important village in the district of Khombu; for it is the last place of any size on the principal route from eastern Nepal to Tibet and is therefore a centre of trade between the two countries. It is the small metropolis of the Sherpas who have close connections, both commercial and religious, with Tibet. They are themselves of Tibetan origin, and are indistinguishable from the people of the great plateau to the north of the main range. They wear the same kind of clothes and have the same religious beliefs and customs, and, though they have a language of their own, they can all speak Tibetan. They lead a semi-nomadic life; each family owns a house and land in several villages at different altitudes, and they move *en masse* from one village to another according to the seasons, to sow or harvest their fields of potatoes and barley. For this reason it is common to find a village temporarily deserted while the inhabitants are working at another at a different level. They graze their sheep and goats and yaks in the high valleys, often several days' march from their villages.

We were given a great welcome in Namche, where we spent two days sorting out our stores and equipment and arranging for supplies of local food. I met many old friends from former expeditions, most of whom brought flagons of *chang* and stood by urging us to drink.

We were provided with a house. Nearly all Sherpa houses are built on the same pattern. They are oblong, two-storied stone buildings, with carved wooden window frames and lattice windows. The front door leads into a dark stable, through which one has to grope, pushing past the oxen and yaks, to a steep wooden ladder leading to a short, narrow passageway on the upper floor. A right-hand turn at the top of the ladder leads to a latrine, a small dark room, with a hole in the middle of the floor which is otherwise deeply covered with grass or pine needles. The other end of the passage leads to the living room which occupies three-quarters of the upper floor. The alcove between the walled-in ladderway and the front wall is used as a kitchen. The fireplace is set on the floor, and an iron frame is used for holding the cooking pots above the fire. Beyond this is a couch reserved for the women. In the front wall to the right of the fireplace there is a line of windows. Beneath this a platform raised about a foot above the floor is covered with carpets and rugs. Here the men sit, cross-legged behind a low wooden

table. The seat of honour is at the end of the platform nearest the fire. The opposite wall, devoid of windows, is lined with shelves, full of great copper basins, wooden bowls, china cups, bamboo churns and other cooking and eating utensils. The far end of the room is cluttered with bags of grain, ropes, wooden ploughs, mattocks and other farm implements. Beds are made up on the floor as they are required. Some houses belonging to well-to-do people have a room beyond, furnished as a small Buddhist shrine.

The ice-fall

We left Namche on September 25, taking with us supplies for seventeen days. In that time we hoped to make a thorough reconnaissance of the great ice-fall, if possible to climb it into the West Cwm, and to see whether or not there was a practicable route from there to the South Col. If we found a route we would then send down for more supplies, carry a camp into the Cwm and climb as far as possible towards the Col. If as we expected there proved to be no practicable route, we would undertake an extensive exploration of the main range, the southern side of which was almost entirely unknown. We had engaged another five Sherpas whom we equipped for work on the mountain, bringing the number up to ten. One of them was Angtarkay's young brother, Angputer, whom I had last met in 1938 when as a lad of fourteen he had come across to Rongbuk from Namche and had carried a load to Camp III (21,000 feet) on Everest. Another fifteen men had been engaged to carry our baggage and supplies to our Base Camp at the head of the Khombu Glacier.

We followed a path across the steep mountainside, 2000 feet above the gorge of the Dudh Kosi, from which we had climbed three days before. On the way we met a very old friend of mine, Sen Tensing, whom I had first met in 1935 when he had come across to Tibet to join the Reconnaissance Expedition. His peculiar appearance in the clothes we gave him had earned him the name of the "Foreign Sportsman." In the years that followed he had been my constant companion in various parts of the Himalaya and Karakoram, and in 1936 I had taken him to Bombay; an adventure which he evidently still regarded as one of the highlights of his career. He had heard news of our approach while herding his yaks in a valley three days' march away, and had hurried down to meet us, bringing gifts of chang, butter and curds. He came along with us, and for the rest of the day he regaled me with memories of the past.

After some miles the path descended into the gorge. We crossed the river by a wooden bridge and climbed steeply through the forest for 2000 feet to the monastery of Thyangboche, built on the crest of an isolated ridge which divided the Dudh Kosi from a large tributary valley known as the Imja Khola. The ridge was shrouded in mist that evening and, as it was growing dark when we reached the monastery, we saw nothing of our surroundings. The monks welcomed us and we found that a large Tibetan tent had been pitched for us on a meadow nearby.

During the past few days we had become familiar with the extraordinary beauty of the country, but this did not lessen the dramatic effect of the scene which confronted us when we awoke next morning. The sky was clear; the

grass of the meadow, starred with gentians, had been touched with frost which sparkled in the early sunlight; the meadow was surrounded by quiet woods of fir, tree-juniper, birch and rhododendron, silvered with moss. Though the deciduous trees were still green there were already brilliant splashes of autumn colour in the undergrowth. To the south the forested slopes fell steeply to the Dudh Kosi, the boom of the river now silenced by the profound depth of the gorge. To the north-east, 12 miles away across the valley of the Imja Khola, stood the Nuptse–Lhotse ridge, with the peak of Everest appearing behind. But even this stupendous wall, nowhere less than 25,000 feet throughout its 5-mile length, seemed dwarfed by the slender spires of fluted ice that towered all about us, near and utterly inaccessible.

We stayed in this enchanting spot till noon, and we visited the monastery during the morning. With its cloistered courtyard, its dark rooms smelling of joss sticks and the rancid butter used for prayer lights, its terrifying effigies, its tapestries and its holy books bound between boards, it resembled most Tibetan monasteries in all save its setting. In the centre of the main room or shrine there were two thrones, one for the Abbot of Thyangboche, the other for the Abbot of Rongbuk. At that time the former was away on a visit to his colleague on the northern side of the great mountain, Chomo Lungma (Everest). Hanging in one of the windows of the courtyard, we were amused to find an oxygen cylinder which had evidently been retrieved from the East Rongbuk Glacier by the Sherpas of one of the early Everest Expeditions. It is now used as a gong which is sounded each evening at five o'clock as a signal for all the women who happen to be there to leave the monastery.

From Thyangboche the way led gently downwards through the woods and across the Imja Khola at a point where the river plunges as a waterfall into a deep abyss, overhung by gnarled and twisted trees with long beards of moss waving in the spray. Beyond the village of Pangboche we left the forest behind and entered highland country of heath and coarse grass. We spent the night of September 26 at Pheriche, a grazing village then deserted, and next morning turned up into the Lobujya Khola, the valley which contains the Khombu Glacier. As we climbed into the valley we saw at its head the line of the main watershed. I recognized immediately the peaks and saddles so familiar to us from the Rongbuk side: Pumori, Lingtren, the Lho La, the North Peak and the west shoulder of Everest. It is curious that Angtarkay, who knew these features as well as I did from the other side and had spent many years of his boyhood grazing yaks in this valley, had never recognized them as the same; nor did he do so now until I pointed them out to him. This is a striking example of how little interest Asiatic mountain peasants take in the peaks and ranges around them.

Two days were spent moving slowly up the glacier and getting to know the upper part of the valley. The weather was fine each morning, but each afternoon we had a short, sharp snowstorm. We had some difficulty in finding water along the lateral moraine, but eventually we found a spring in a little sheltered hollow on the west bank of the glacier at the foot of Pumori, and established our base camp there at an altitude of about 18,000 feet. Later we found that the spring was fed from a small lake a few hundred feet above. There was a small heather-like plant growing on the moraine which served

as fuel and supplemented the supplies of juniper that we had brought from below.

On September 30 Riddiford, Ward and Bourdillon, with two Sherpas, Passang and Nima, crossed the glacier to reconnoitre the lower part of the ice-fall. Hillary and I climbed one of the buttresses of Pumori so as to study the ice-fall as a whole and, in particular, to examine the position of the hanging glaciers on either side of the gorge leading into the Cwm and plot the areas of potential danger from ice avalanches falling from these. We reached a height of just over 20,000 feet. It was a wonderful viewpoint. We could see right across the Lho La to the North Peak and the North Col. The whole of the north-west face of Everest was visible, and with our powerful binoculars we could follow every step of the route by which all attempts to climb the mountain had been made. How strange it seemed to be looking at all those well-remembered features from this new angle, and after so long an interval of time and varied experience; the little platform at 25,700 feet where we had spent so many uncomfortable nights, Norton's Camp VI at the head of the north-east spur, the Yellow Band and the grim overhanging cliffs of the Black Band, the Second Step and the Great Couloir—they were all deep in powder snow as when I had last seen them in 1938. Straight across from where we stood, Nuptse looked superb, a gigantic pyramid of terraced ice.

But the most remarkable and unexpected aspect of the view was that we could see right up to the head of the West Cwm, the whole of the west face of Lhotse, the South Col and the slopes leading up to it. Indeed a view from the interior of the Cwm itself could hardly have shown us more. We estimated that the floor of the Cwm at its head was nearly 23,000 feet, about 2000 feet higher than we had expected. From there we could see that there was a perfectly straightforward route up the face of Lhotse to about 25,000 feet, whence it seemed a traverse could be made to the South Col. This long traverse would only be feasible in good snow conditions, and at present conditions were obviously anything but good.

The sudden discovery of a practicable route from the West Cwm to the South Col was most exciting. But we had come here to study the ice-fall and this occupation soon sobered our spirits. The total height of this frozen cataract was about 2000 feet; a rough transverse corridor divided it into two equal sections. The glacier descends from the Cwm in a left-hand spiral, so that the lower section of the ice-fall was facing our viewpoint while the upper half was largely in profile. With the field glasses we picked up two figures on the lower part; from their movements we recognized them, even at that distance, as Riddiford and Passang. Of the others there was no sign. We heard later that they had taken a different route across the lower glacier and had been forced to turn back by a mass of ice pinnacles before reaching the foot of the ice-fall. Riddiford and Passang had made splendid progress, though they were obviously having to work very hard in the soft snow. By 2 o'clock they had reached a point about four-fifths of the way up the lower section. Here they stayed for an hour and then returned.

Such excellent progress by a party of only two at the very first essay was in itself most encouraging. But from where we were standing it looked as though the corridor above them was in danger of being swept throughout its

length by ice avalanches falling from a great line of hanging glaciers on the left-hand wall of the gorge; it looked indeed as though the surface of the corridor was composed entirely of avalanche debris. The right-hand side of the lower ice-fall and of the corridor were clearly menaced from a mass of hanging glaciers in that direction, while our profile view of the upper ice-fall made it look very ugly. There was an easy way round the upper ice-fall to the left, but this was obviously a death trap.

One of the many reasons why an attempt upon a great Himalayan peak offers so very much less chance of success than climbing a mountain of Alpine size is that a great part of the route has to be traversed again and again by parties of laden men carrying supplies to the higher camps. All objective dangers must be judged from this standpoint. The risk, say, of walking for ten minutes under an unstable ice-tower, which might be accepted by a party of two or three unladen mountaineers, is obviously increased a hundred fold in the case of large parties of heavily laden men passing over the same ground dozens of times. The rules of mountaineering must be rigidly observed.

It now seemed that we would be faced with a most difficult decision: to abandon this wonderful new route to the summit of Everest that had appeared like a vision, this chance that we had scarcely dared to hope for, not because the way to it was beyond our powers but because on a small section of the approach the party, and particularly the Sherpas, must repeatedly be exposed to the risk, however slight at each individual exposure, of extermination.

When we met Riddiford in camp that evening he was much more optimistic about the difficulties on the upper part of the ice-fall, but he had not been in a position to judge the avalanche danger. On the following day, October 1, while Bourdillon and Angtarkay repeated our visit to the Pumori ridge and climbed to a point some 300 feet higher, Hillary and I made a reconnaissance from another angle. This time we went up to the head of the glacier and climbed again to about 20,000 feet on a ridge of the peak bounding the Lho La on the west. From here, although we could not see into the Cwm, we had a much better view of the upper part of the ice-fall and of the corridor. We saw that, at this time of year at any rate, the avalanches from the left swept rather less than half the length of the corridor, and that a crossing made at about its centre would be reasonably safe. We could also trace a good route through the upper part of the ice-fall.

On October 2, Riddiford, Hillary, Bourdillon and I, with three Sherpas, Passang, Dannu and Utsering, took a light camp up to the foot of the ice-fall with the intention of making a concentrated attempt to climb from there into the West Cwm. At this time Murray and Ward were both still suffering from the effects of altitude and remained at the Base Camp for further acclimatization. The next day the weather was bad; it snowed gently most of the day and we stayed in our tents. The air about us was absolutely calm. At about 10 o'clock we heard a dull roar which sounded like an Underground Railway train. At first we thought it was a distant avalanche somewhere high up in the Cwm. We were quite accustomed to the thunder of these, falling intermittently all around us, from Nuptse, from the great ice cliffs of the Lho La and from the ridges of Pumori. As a rule the noise did not last more than a minute or two at a time. When after a quarter of an hour this distant roar

was still maintained, we began to think that somewhere far away an entire mountainside must be collapsing. After an hour however even this theory seemed hardly tenable, and eventually we came to the conclusion that it must be caused by a mighty wind blowing across the Lho La and over the ridges of Everest and Nuptse. It went on throughout the day. No breeze ruffled the canvas of our tents.

The morning of October 4 was fine and very cold. We started soon after it was light. One of the difficulties of working on the ice-fall, particularly at this time of year, was that the sun reached it so late in the day. At first we were moving over hard ice, but as soon as we reached the icefall we were up to our knees in soft snow. Our feet became very cold, and once during the morning Hillary and Riddiford had to remove their boots, which were designed for their summer expedition and were only large enough for two pairs of socks, and have their feet massaged back to life. With Riddiford's tracks to follow we had no difficulty in finding our way through the maze of crevasses and ice walls. After three and a half hours' steady going we reached his farthest point. Here Bourdillon, who was also still suffering a good deal from the effects of altitude, decided to stop and await our return. The place was just beside a prominent ice-tower which was thereafter known as "Tom's Serac." As the sun was now up, he would be able to keep warm enough.

Indeed our trouble was now exactly the reverse. With the scorching glare of the sun on the fresh snow, and the stagnant air among the ice-cliffs it was rather like working in front of a furnace. This, combined with the altitude, very soon drained our energy and robbed all movement of pleasure. We shed all our upper garments except our shirts, but even so we poured with sweat, and before long our panting produced a tormenting thirst. The going now became far more complicated and laborious. Threading our way through a wild labyrinth of walls, chasms and towers, we could rarely see more than 200 feet ahead. The snow was often hip deep so that, even with so many to share the labour of making the trail, progress from point to point was very slow. The choice of one false line alone cost us an hour of fruitless toil.

But technically the climbing was not difficult, and even if it had been we had plenty of time for the job. By the middle of the afternoon we seemed to be approaching the top of the ice-fall. We had decided to turn back not later than four o'clock in order to reach camp by six, when it would be getting too dark to see. Even that was running it rather fine since it did not allow for such accidents as the breaking of a snow bridge; and to become involved in such a complication after dark would be to run considerable risk of frostbite.

From the last line of seracs we looked across a deep trough to a level crest of ice marking the point where the glacier of the Cwm took its first plunge into the ice-fall, like the smooth wave above a waterfall. The trough was really a wide crevasse, partly choked by huge ice blocks, some of which appeared none too stable. Crossing it was the most delicate operation we had encountered.

By 3.50 we reached the final slope beyond the trough, less than 100 feet below the crest, from which we expected to have a clear view along the gently sloping glacier of the Cwm. We had to climb this diagonally to the

right so as to avoid a vertical brow of ice directly above. Passang, whose turn it was, took the lead; Riddiford followed and I came next. When we were on the slope it became obvious that the snow was most unstable and must be treated with great caution. By this time Passang had advanced about 60 feet. Suddenly the surface began to slide downwards, breaking into blocks as it went. Passang, who was at the upper edge of the break, managed with great skill to dive over it and ram his ice axe into the snow above. I was only a few yards from Hillary who had a firm anchorage on an ice block at the beginning of the slope and I was able without much difficulty to scramble off the moving slope back to him. Riddiford went down with the slope, and was left suspended between Passang and me, while the avalanche slid silently into the trough. It was a nasty little incident which might with less luck have had rather unpleasant consequences.

It was now high time to retreat. Going down was of course almost effortless compared with the labour of coming up. We had the deep trail to follow and we could jump or glissade down the innumerable little cliffs, each of which had cost a great deal of time and hard work to climb. It was after 5.30 when we reached Bourdillon who had had a longer wait than he had bargained for, and was by now getting both cold and anxious. Soon after we had started down, the ice-fall became enveloped in mist. Later, this broke behind us and we saw, high above the darkening Cwm, the north face of Nuptse, a golden tracery of ice lit by the setting sun. We reached camp as it was getting dark, very tired after a strenuous day.

We were well satisfied with this reconnaissance. It was rather disappointing at the last moment to be denied a view into the Cwm, from the top of the ice-fall, though in fact it would not have shown us much more than we had seen already. But we had climbed practically the whole of the ice-fall in a single day despite abominable snow conditions and the fact that over by far the largest and most difficult part we had been working our way across entirely new ground. In time the route could certainly be greatly improved, and the climb would then be done in half the time and with less than half the effort. We thought that the snow conditions would probably improve; but even if they did not, the final slope could certainly be climbed and safe-guarded by suspending lifelines from above. Finally, at this time of year at least, the route seemed to be reasonably free from the menace of ice avalanches. We had little doubt that with a few days' work we could construct a safe packing route up the ice-fall into the West Cwm.

We decided however to wait for a fortnight before attempting to do this. There were three seasons for this decision. The first was to allow time for snow conditions on the ice-fall to improve. Secondly, we had seen that there was still an enormous amount of monsoon snow lying on the upper slopes of Lhotse and Everest which would make it impossible to climb far towards the South Col, to say nothing of the possible risk of large snow avalanches falling into the Cwm from above. While we knew that at altitudes of 25,000 feet and above this snow would not consolidate, we had reason to believe that by the beginning of November a great deal of it would have been removed by the north-westerly winds which were already becoming established. Finally, half the party were badly in need of acclimatization before they could undertake

any serious work, even in the ice-fall. We spent the fortnight making journeys into the unexplored country to the west and south.

On October 19 Hillary and I, who had been working together during this fortnight, returned to the Base Camp on the Khombu Glacier. We had expected the others to get back on the same day, but they did not arrive until nearly a week later. On October 20 and 21 we took a camp to the old site at the foot of the ice-fall. This time we brought with us a large twelve-man double-skinned dome tent designed for the Arctic. It was well worth the labour required to level a sufficiently large area of the ice surface on which to pitch it for, after the tiny mountain tents we had been using hitherto, it was positively luxurious and, having more room, we found it a great deal easier to get off to a really early start in the morning. On October 22 we started work on the ice-fall. Snow conditions had improved slightly, but a number of new crevasses had opened up across our former route and these caused us a little trouble to negotiate. However, by the end of the first day's work we had made a solid and completely safe route up as far as "Tom's Serac." Near this we marked out a site for a light camp from which to work on the upper part of the ice-fall, but we decided that for the present we would continue to work from our comfortable camp below.

Next day we started early, taking with us Angtarkay and Utsering. It was a glorious morning. With every step of the way prepared, we climbed without effort, breathing no faster than on a country walk at home, and reached "Tom's Serac" in one hour and twenty minutes. We paused there for a brief rest that we hardly needed, while the sun climbed above the great Nuptse–Lhotse ridge to quicken the frozen world about us. We were in a mood of exultant confidence, for we expected that very day to enter the great Cwm.

But immediately above the serac we ran into difficulties. A broad crevasse had opened across our former route and it took us an hour and a half, and a lot of very hard work, to find a way across it. This check, though a salutary warning against over-confidence, was not serious, and it was not until we were over the crevasse that the real trouble began. Here, about 100 yards from the serac, we found that a tremendous change had taken place. Over a wide area the cliffs and towers that had been there before had been shattered as though by an earthquake, and now lay in a tumbled ruin. This had evidently been caused by a sudden movement of the main mass of the glacier which had occurred some time during the last fortnight. It was impossible to avoid the sober reflection that if we had persisted with the establishment of a line of communication through the ice-fall and if a party had happened to be in the area at the time, it was doubtful whether any of them would have survived. Moreover the same thing might happen on other parts of the ice-fall.

With regard to our immediate problem however, we hoped that the collapse of the ice had left the new surface with a solid foundation, though it was so broken and alarming in appearance. Very gingerly, prodding with our ice-axes at every step and with 100 feet of rope between each man, we ventured across the shattered area. The whole thing felt very unsound but it was difficult to tell whether the instability was localized around the place one was treading or whether it applied to the area as a whole. Hillary

was ahead chopping his way through the ice blocks when one of these, a small one, fell into a void below. There was a prolonged roar and the surface on which we stood began to shudder violently. I thought it was about to collapse, and the Sherpas, somewhat irrationally perhaps, flung themselves to the ground. In spite of this alarming experience it was not so much the shattered area that worried us as the part beyond, where the cliffs and seracs were riven by innumerable new cracks which seemed to threaten a further collapse. We retreated to the sound ice below and attempted to find a less dangerous route. Any extensive movement to the left would have brought us under fire from the hanging glaciers in that direction. We explored the ground to the right, but here we found that the area of devastation was far more extensive. It was overhung moreover by a line of extremely unstable seracs.

We returned to camp in a very different frame of mind from the joyous mood in which we had climbed the lower part of the ice-fall only a few hours before. It seemed obvious that although it might be a permissible risk for a party of unladen mountaineers, working on long ropes and taking every available precaution, to attempt the ice-fall (and even this was doubtful) we would not be justified in trying to climb it with a party of laden porters whose movements are always difficult to control. It looked as though, after all, we were to be faced with the decision which we had dreaded three or four weeks before; to abandon the attempt to reach the Cwm, not because the way was difficult but because of a danger which by the very nature of its underlying causes was impossible to assess with any certainty. This does not however mean the total abandonment of the route; for the condition of ice-falls is subject to considerable seasonal variation, and it is not unreasonable to expect much better conditions in the spring than in the autumn. Nevertheless it was a bitter disappointment not to be able to proceed with our plan of carrying a camp through into the Cwm and making a close examination of the route to the South Col. We agreed to defer the final decision until we had made another reconnaissance of the ice-fall with the whole party.

The following day we again climbed the ridge near the Lho La. The view was not very encouraging for we could see no way of avoiding the shattered area, which was in fact a belt stretching right across the glacier, though the upper part of the ice-fall above the corridor so far as we could see was undisturbed. On October 26 the rest of the party arrived back at the Base Camp and next day we all climbed the ridge of Pumori from which Hillary and I had first looked into the West Cwm on September 30. We saw that a certain amount of monsoon snow had been removed by the north-west wind from the peak of Everest, though the north face of the mountain was still in an unclimbable condition. There was no obvious change in the snow conditions inside the Cwm, on Lhotse, or on the South Col.

That evening we reoccupied the camp below the ice-fall and on October 28 all six of us, together with Angtarkay, Passang and Nima, set out for the ice-fall once more. Our chief object was that the others should examine the situation for themselves so that we could come to a united decision; though Hillary and I, too, were anxious to have another look at it. We arrived at the shattered area by the time the sun had reached us. Only minor changes had

taken place in the past five days, and this encouraged us, with great care, to cross it and make our way over the delicately poised seracs beyond. Passang and Angtarkay made no secret of their apprehension, and constantly pointed out to me that it was no place to take laden men. Beyond the corridor we found that the upper ice-fall was in a fairly stable condition, only one serac having collapsed across our former route. By ten o'clock we reached the final wall dominating the ice-fall. The steep slopes below this were in the same dangerous condition as they had been at the beginning of the month; but a fin of ice had become detached from the wall and, while other routes were being explored, Bourdillon succeeded in cutting steps up this which enabled us to reach the top of the wall. This was a fine effort for it involved his cutting his way through a deep layer of unstable snow into the ice beneath. By keeping to the edge of the fin he was able to avoid any risk of a snow avalanche, but as the whole thing overhung a profound chasm into which it might collapse it was as well to avoid having more than one man on it at a time.

We now stood above the ice-fall, on the lip of the West Cwm, and we could look up the gently sloping glacier, between the vast walls of Everest and Nuptse, to its head. But we soon found that we had by no means overcome all the difficulties of entry into this curious sanctuary. A little way farther on, a vast crevasse split the glacier from side to side, and there were indications of others equally formidable beyond. To cross these in their present state would have taken many days of hard work and a good deal of ingenuity, and unless we could carry a camp up to this point we were not in a position to tackle them. I have little doubt that in the spring they would be a great deal easier. We sat for nearly an hour contemplating the white, silent amphitheatre and the magnificent view back across the Khombu Glacier to Pumori, Lingtren and the peaks beyond the Lho La. Then we returned down the ice-fall.

The fact that we had now climbed the ice-fall without mishap made the decision to abandon the attempt to carry supplies through into the Cwm all the more difficult. We discussed it at great length. The next day Ward and Bourdillon climbed the ridge near the Lho La to satisfy themselves that there was no alternative route, while Hillary and I paid one more visit to the ice-fall. Angtarkay and Passang were still convinced that it would be madness in the present conditions to try to carry loads through it, and unfair to ask the Sherpas to do so. There was nothing for it but to submit, hoping that we would get another chance in the spring.

Exploratory journeys

Our failure to make a safe route up the ice-fall, and so to bring camps and supplies through into the West Cwm, disappointing though it was, had one great consolation, for it allowed us more time than we might otherwise have had to explore some of the great areas of unknown country along the southern side of the main range. During the period between our two visits to the ice-fall we divided into two parties. Murray, Riddiford, Bourdillon and Ward made their way westward from the Base Camp, up a long tributary glacier which took them past Pumori and along the southern side of the watershed. Apart

from the exploration of the area, their chief object was to find a pass across the range to the north, which the Sherpas had told us about. We assumed that it must lead over to the West Rongbuk glacier and it was hoped that the party might be able to climb Pumori from there. I was particularly interested in this alleged pass in view of our failure in 1935 to find any route across this part of the range. They found however that no such pass existed.

From the head of the tributary glacier they crossed a col which led them into the upper basin of the Dudh Kosi at the head of which they found themselves in a mighty cirque formed by the two great mountains of Cho Oyu (26,867 feet)[1] and Gyachung Kang (25,910 feet). On the eastern flank of this cirque was the Nup La which had been reached by Hazard from the Tibetan side in 1924. For two days they climbed towards this col up an ice-fall, a good deal more difficult than the West Cwm ice-fall though much less dangerous, before they finally gave up their attempt to reach the watershed. Then they descended the Ngojumba Glacier and the Dudh Kosi valley to Namche.

Meanwhile Hillary and I explored the country to the south of Mount Everest. Our chief objective was to find a way through the tangle of ranges to the Kangshung glacier which flows from the eastern flanks of Everest, and so to link up with the explorations of the 1921 Reconnaissance Expedition. In this project we were stimulated by the Sherpas' statement that at the head of the Imja Khola there was a pass leading over to Kharta in Tibet. We took with us a young man called Ang Dorje who knew that valley well and who was most insistent that the pass existed. The upper basin of the Imja is contained on the north by the Nuptse–Lhotse wall and on the east and south by dozens of unnamed peaks between 20,000 and 24,000 feet high. When we reached its head we saw at once that there was no practicable way across the mountain to the east. Ang Dorje was not in the least abashed, and merely said that he had supposed that we, as mountaineers, would find a way. Turning southwards however we succeeded with some difficulty in crossing a col about 20,000 feet high over into the basin of the Hongu Khola, where we camped on the shores of a big lake. We looked across a wide basin to the peaks of the Chamlang massif. We were now well beyond the country known to the Sherpas. We found evidence that the Hindu Nepalis from the south penetrated with their flocks to these lofty valleys.

We crossed the Hongu basin to the eastward and found a pass (about 20,300 feet) leading over to the great Barun glacier flowing south-eastwards at the foot of Makalu (27,790 feet). From here, if we had had another three days' food with us, we could undoubtedly have reached the Kangshung. Another tantalizing project that presented itself, if only we had had the time and resources to undertake it, was to descend the Barun and to plunge into the great unexplored gorges leading down to the Arun River. But once embarked upon this game of mountain exploration in these remote ranges there is no end to its fascinating possibilities.

All this time the weather was fine and the period spanned the full moon. The nights were very cold. The mornings were sparkling clear; each afternoon cloud welled up out of the valleys and wrapped the peaks, each evening at sunset it dissolved. It was then, in camp, that we saw this stupendous

[1] Earlier editions of the Survey of India map give the height as 26,750 feet.

country at its best, for each peak in turn was framed in shifting mist, its golden tracery of ice glowing in deep relief; no longer a mere part of a mountain massif but floating in sublime isolation. Before the cloud had quite vanished, the moon would climb above some lofty crest, and presently all the peaks were there again, frozen against the night sky.

Returning across the Hongu basin we crossed a third pass, also about 20,000 feet, on its western rim just to the south of the beautiful peaks of Ama Deblam which, as we had hoped, took us back into the valley of the Imja Khola. Finally we crossed a high ridge running southward from Nuptse and so back to our Base Camp on the Khombu Glacier.

Our third field of activity was the Gauri Sankar range which we set out to explore at the beginning of November after work on the ice-fall had been abandoned. We went north-west from Namche along the valley of the Bhote Kosi. At Thami, Hillary, Riddiford and the geologist Dutt, who during October had been carrying out extensive geological investigations over a wide area, turned up a valley to the west and crossed the Tasi Lapcha. This pass though involving some difficult ice climbing was known to, and occasionally used by, the Sherpas. It led through a mass of spectacular granite peaks over a northerly offshoot of the main range into a most remarkable gorge known as the Rolwaling, running westward under the southern precipices of Gauri Sankar. The rest of us continued along the Bhote Kosi to the little grazing village of Chhule. From here Murray and Bourdillon, taking four days' food with them, went on to visit the Nangpa La, the pass by which the trade route crosses from Solu Khombu to Tibet. It is approached on either side of the watershed up a long glacier and is situated in an extensive icefield at an altitude of more than 19,000 feet. It is, so far as I know, the highest pass on any trade route in the world. It carries a considerable volume of traffic throughout most of the year, and deep grooves worn in the glacier ice bear witness to the passage of countless yaks. No ponies are taken across; not because it is too high, for ponies are used extensively in the Karakoram Pass which is not much lower, but because of a curious superstition that if anyone attempts to take a pony across not only will the pony die but the owner will also perish. It is by way of the Nangpa La that the Sherpas have their intimate contact with Tibet; large numbers of them cross it each year not only to trade, but to make a pilgrimage to the Rongbuk Monastery. From near the pass, Murray and Bourdillon saw a possible way of climbing Cho Oyu.

From Chhule, Ward and I made our way westward into a group of high mountains whose position in relation to the main range was difficult to determine. After some time spent in reconnaissance we found what seemed to be the only way through them, over a col which we subsequently named the Menlung La. Travelling very light and taking enough food for a week, we crossed this col together with Sen Tensing. It led over to a large glacier system, the main ice-stream of which was flowing southward; which suggested that we were still on the southern side of the main range. However when we came to explore our new surroundings we found that we were in a vast amphitheatre, in many respects very like the Nanda Devi basin, in the centre of which, completely isolated from the main massif, stood a

most lovely peak of pale granite. It was the highest peak of the range, being somewhat higher than Gauri Sankar. We named it "Menlungtse." We found that the waters of the basin drained to the north-west and plunged directly into a system of tremendous canyons the main artery of which we identified as the Rongshar. It is one of those remarkable rivers which, like the Arun, rise far to the north on the Tibetan plateau and have cut their way clean through the great Himalayan range. It is certainly one of the most spectacular gorges I have seen. We also succeeded in reaching the crest of the main range south of Menlungtse at a point about 19,500 feet high. From here we looked straight down 7000 feet into the Rolwaling. Sen Tensing told me that this name was a Sherpa word meaning the furrow made by a plough. We were surprised to find that there was a way down the huge precipices into the gorge.

It was on one of the glaciers of the Menlung basin, at a height of about 19,000 feet, that, late one afternoon, we came across those curious footprints in the snow which have caused some public interest in this country. We did not follow them farther than was convenient, a mile or so, for we were carrying heavy loads at the time, and besides we had reached a particularly interesting stage in the exploration of the basin. I have in the past found many sets of these curious tracks and have tried to follow them but have always lost them on the moraine or rocks at the side of the glacier. These particular tracks seemed to be very fresh, probably not more than twenty-four hours old. When Murray and Bourdillon followed us a few days later the tracks had been almost obliterated. Sen Tensing, who had no doubt whatever that the creatures (for there had been at least two) that had made the tracks were *Yetis* or wild men, told me that two years before he and a number of other Sherpas had seen one of them at a distance of about 25 yards at Thyangboche. He described it as half man and half beast, standing about 5 feet 6 inches, with a tall pointed head, its body covered with reddish brown hair but with a hairless face. When we reached Katmandu at the end of November, I had him cross-examined in Nepali (I conversed with him in Hindustani). He left no doubt as to his sincerity. Whatever it was that he had seen he was convinced that it was neither a bear nor a monkey, with both of which animals he was of course very familiar. Of the various theories that have been advanced to account for these tracks, the only one which is in any way plausible is that they were made by a langur monkey, and even this is very far from convincing, as I believe those who have suggested it would be the first to admit.

These various exploratory journeys gave us an intimate knowledge of a stretch of 60 miles of the Great Himalaya Range, in a country hitherto practically unknown to western travellers. This form of mountaineering, the exploration of unknown peaks, glaciers and valleys, the finding and crossing of new passes to connect one area with another, is the most fascinating occupation I know. The variety of experience, the constantly changing scene, the gradual unfolding of the geography of the range are deeply satisfying, for they yield a very real understanding, almost a sense of personal possession, of the country explored.

(The text of the above paper is taken from 'Everest reconnaissance 1951, by Eric Shipton; to be published by Messrs. Hodder and Stoughton Ltd.

in the autumn of 1952, with over sixty plates. It is, of course, a fuller account of the Expedition than was contained in the spoken address given by Mr. Shipton at the Evening Meeting of 4 February 1952 which resulted in the following discussion.—*Ed. G.J.*)

DISCUSSION

Evening Meeting, 4 February 1952

Before the paper the PRESIDENT (Mr. J. M. WORDIE) said: The speaker tonight is Mr. Eric Shipton who has made no less than ten expeditions to the Himalaya, of which five have been to Mount Everest. There is probably no one else in this country so well qualified to speak about Everest as is our lecturer this evening.

Mr. Eric Shipton then read his paper

Professor G. I. FINCH: I am not going to attempt to add anything to the most interesting discourse which Mr. Shipton has given us. I ask you to look with me a little into the future, with a view to helping Shipton and his friends to climb Everest by the South Col, which we all sincerely hope they will attempt in 1953.

I am convinced from the photographs I have seen and, above all, by Mr. Shipton's clear, sober description and careful balancing up of potentialities of the route and all its objective dangers, that he has found in the West Cwm a practicable route to the summit. I am also convinced that most if not all of the upper part, above say 24,000 or 25,000 feet, is probably more suitable for an assault on a mountain of the height of Everest than the route which we have known hitherto, leading up the North Col and the north side of the mountain.

But there is one very large measure of help which I should like to see offered to Shipton and his party. What is wanted is some way of converting the ascent of the great ice-fall from a pack route (which it will have to be if they are going to carry all their own equipment up into the great basin of the West Cwm) into a climber's route—a climber's route whereby they will not have to carry or pack anything up through that broken ice-fall but will merely have to climb it under what I might call ordinary Alpine climbing conditions. The party should be supplied with all the stores they need by means of air drops into the basin of the West Cwm. It's a matter of expense. But if you do not incur that expense you are risking men's lives in continually moving up and down and packing heavy weights; and having therefore to move slowly up through that ice-fall to the West Cwm.

The South Col is obviously a practicable proposition, with a reasonable measure of objective risk. I am not saying there is no risk; there is a risk in the ice-fall, but it is a reasonable measure of objective danger which a responsible party can undertake provided they are lightly loaded and able to move fast. The risk entailed in the packing of heavy loads over the ice-fall, by necessarily slow-moving porters, is altogether another matter and should not be incurred. I therefore hope that Shipton's party will be provided with a reliable air-lift for stores into the great basin above the ice-fall.

The PRESIDENT: We all wish Mr. Shipton every success, not only in the attempt he is to make this year on Cho Oyu, but in the greater venture which will be made in the year following. It is hoped that the Nepalese Government, which gave permission for the reconnaissance in 1951, will be willing also to give permission for the bigger party in 1953.

MAPPING ROMAN LIBYA

R. G. GOODCHILD

OUR LIBYAN EXPEDITIONS of 1950–51 were a continuation, over a rather wider area, of the archaeological reconnaissances described in a previous paper in the *Journal*.[1] They differed mainly in that their aim was the collection of information for a map of Roman Libya, and that they were therefore concerned as much with the coastal regions as with the interior. In both years a summer programme of field-work was organized under the auspices of the Map of Roman Libya Committee (under the Chairmanship of Professor R. E. M. Wheeler) of the Society of Antiquaries of London, and with the financial support of several universities and learned societies, including the Royal Geographical Society.

During the two seasons' work, small parties of investigators [2] examined scores of ancient sites scattered between Sirte (Tripolitania) and Ain el-Gazala (Cyrenaica) and in several inland areas. We enjoyed the greatest possible help from the British military authorities in Cyrenaica, including the use for a fortnight each season of a small column of desert-worthy vehicles.[3] To Lieut. A. Weston-Lewis, 16/5 Lancers, who commanded this column on both occasions, and to the officers and other ranks who participated in Exercises "Roman Swan" I and II, we are deeply grateful. The cooperation of H.Q., R.A.F., Malta [4] enabled us to fly over part of the desert frontier area, and to obtain air photographs of some of the ancient sites. Our main work was however on the ground. To the Governments of Tripolitania and Cyrenaica we are indebted for many facilities.[5]

It should first be explained that the term Roman Libya is used here to describe those parts of the Roman Empire which are now included within the boundaries of the recently constituted Kingdom of Libya. This is an arbitrary definition, accepted for reasons of convenience. The Romans themselves used the name "Libya" either in a general sense, to describe the whole of North Africa, or in an administrative sense, as an official name for the regions between Alexandria and Cyrenaica.[6] From the viewpoint of history

[1] *Geogr. J.* 115 (1950) 161–78.

[2] Mr. M. Ballance (1950) and Mr. D. Smith (1950–51) were my principal assistants, and the under-named also took part in the work of visiting and recording sites: Messrs. M. de Lisle, J. Eames, R. McGregor, J. Spaul, P. Titchmarsh (1950); R. Bradfield, V. Hancock, D. Strong (1951). Mr. A. McK. Frood, Lecturer in Geography at Reading University, accompanied us during the 1950 season, as did also Mr. C. Musgrave.

[3] For army assistance we were particularly indebted to Brigadier E. G. Andland, C.B., C.B.E., M.C.

[4] Air cooperation was kindly arranged by Group Captain J. C. Larking, D.F.C.

[5] We received the greatest help from Mr. Stewart Perowne and Mr. C. N. Johns of the Government of Cyrenaica; and from Mr. R. Goddard-Wilson of the British Residency at Benghazi.

[6] From the administrative reforms of Diocletian (A.D. 297) until the Arab invasions, the area of Cyrenaica was split into two provinces, Upper and Lower Libya.

and culture Tripolitania was an eastern extension of the realm of Carthage and became a Latin-speaking province with a strong Punic tradition. Cyrenaica was colonized by Greeks from Thera (Santorin) and gravitated, culturally and politically, towards Egypt: it remained Greek-speaking until the Islamic invasions.

Despite these differences, there is much to be said for treating the whole of northern Libya as a single unit in historical geography. Tripolitania and Cyrenaica were both isolated from their neighbours by coastal deserts, and both had a desert hinterland at a relatively short distance from the coast. In both cases a coastal plain with oases gave rise to large cities, whilst a well-watered plateau at its rear provided opportunities for agricultural development based on village and farm rather than on urban units. The more abundant vegetation of the Cyrenaican plateau, due to heavier rainfall and a stiffer soil, gives the superficial impression that this was the better of the two territories; but Tripolitania has greater water resources in the steppe and "pre-desert" areas, and has always been able to support a larger population. During the later period of Roman history, when North Africa was being invaded by savage tribes from the edges of the desert, Tripolitania and Cyrenaica had both to face the same problems and to coordinate their defensive policy in the face of a common menace; but it was not until the second half of the sixth century A.D., in the final phase of Roman rule, that the eastern and western halves of Libya actually came under a single administration.[1]

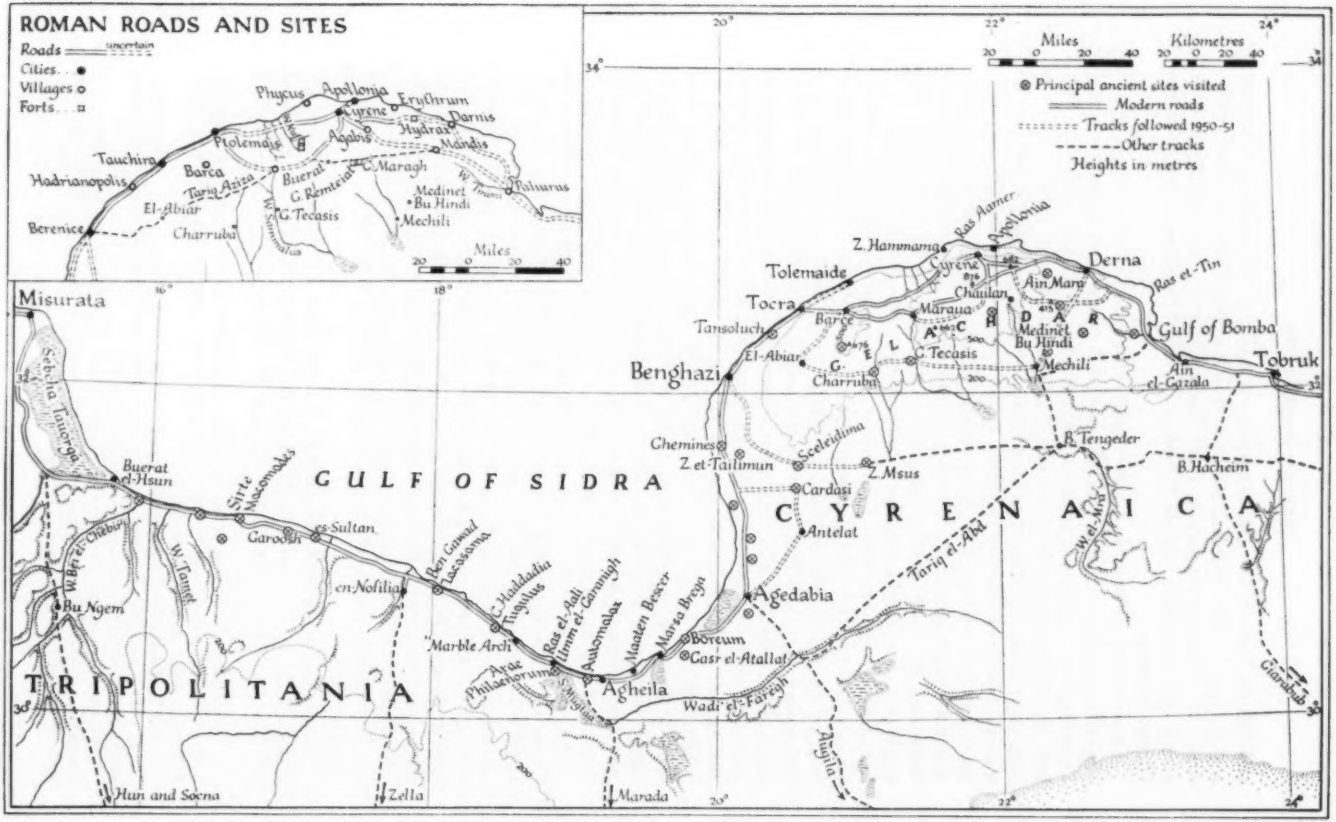
Our tasks, for the purposes of compiling the map of Roman Libya, were those of examining as many ancient sites as possible, of ascertaining which of them belonged to the Roman period, of recording their visible remains by plan and photograph, and of identifying them, where possible, with the localities listed in the ancient geographies. The latter include, in the case of Libya, the Geographies of Strabo and Ptolemy, the Roman road itineraries (Antonine Itinerary and Peutinger Map), and that invaluable "Mariner's Guide" of antiquity, the 'Stadiasmus Maris Magni.'[2] Needless to say, the identification of an ancient place-name is only possible when the classical texts give some firm indication of its locality; and for this reason it has proved difficult to identify places which are not on the coast, or which do not appear in the road itineraries. Ptolemy's map of Libya does not inspire confidence. Small coastal reefs are shown as miles out to sea, and localities which were on the plateau only 20 miles from the coast are marked as being in the heart of the desert.[3]

Our investigations took place in two distinct areas: in the Syrtica, along the shores of the Gulf of Sidra, and in Cyrenaica proper, between Benghazi and the Gulf of Bomba. Of these two regions, the Syrtica was the least known to

[1] The 'Descriptio orbis Romani' of George of Cyprus shows Tripolitania under the Diocese of Egypt, whereas previously it had formed part of the African Diocese, Cyrenaica alone coming under Egypt.

[2] The best edition of the 'Stadiasmus' is Muller's ('Geographi Graeci Minores,' Paris, 1885). His Atlas is a little out of date, but his identifications have, in the main, been confirmed by our own archaeological findings.

[3] Ptolemy also places the towns of Neapolis and Chaerecla in the Pentapolis, near Ptolemais, whereas the historian Ammianus Marcellinus states specifically that they were in Lower Libya, *i.e.* east of Derna.



Modern routes and ancient sites in Libya

archaeologists, the report of the Beechey brothers (1821) representing the latest available information.[1] In Cyrenaica proper, much important work had been done by the Italian government on the sites of the great Graeco-Roman cities, but the interior, which had been in a state of rebellion up to 1930, had not been investigated.

The Syrtic coast road from Misurata to Benghazi, built by Marshal Balbo in 1935, is over 800 kilometres long and traverses an area which is in places notoriously barren. It is however an exaggeration to say that Tripolitania is separated from Cyrenaica "by a 500-mile strip of desert,"[2] for the region around the little town of Sirte is well watered and fertile, and in years of drought the herds of Tripolitania are transported to these lush pastures. One can, in fact, divide the shores of the Syrtic Gulf into four regions of differing character, as follows: (a) Misurata–Buerat (Kilo. 211–377)[3] barren plains on the edge of the Sebcha Tauorga; (b) Buerat–Nofilia (Kilo. 377–601)—good pasture, decreasing after es Sultan (Kilo. 524); (c) Nofilia–Marsa Brega (Kilo. 601–795)—very barren plains with large salt-marshes at foot of gulf; (d) Marsa Brega–Benghazi (Kilo. 795–1033)—fair pasture. In area (a) water is extremely scarce; areas (b) and (d) offer numerous wells of good capacity and quality; area (c) offers a few wells of brackish water, and one good and abundant series of wells (which the ancients named the "springs of Ammon") at Maaten Bescer (Kilo. 773), east of Agheila.

We found, as might be expected, that the extent of ancient settlement in the Gulf varied according to the availability of water. In area (a) there were virtually no ancient remains, whereas in (b) we found a great concentration of Roman farmhouses in the coastal belt, for some 50 kilometres each side of Sirte. In (c) ancient settlement was limited normally to a few road-stations and coastal landing-places, and in (d) there were scattered farms in favoured areas. Two types of Roman farm are encountered in Libya, the "open" and the "fortified"; and in the area around Sirte we found numerous examples of each type. Accompanying the "open" farms were pagan funerary monuments which, like the farmhouses themselves, were built of strong concrete, no doubt because of the shortage of good building stone in that area.[4] Around Marsa Brega, in area (d), the farms were all fortified, and probably belong to the period of Justinian who took energetic steps to defend that part of the Gulf.

The ancient geographies show that there were a number of small village

[1] F. W. and H. W. Beechey, 'Proceedings of the expedition to explore the northern coast of Africa' (London, 1828). The archaeological information contained in Heinrich Barth's 'Wanderungen durch die Küstenländer des Mittelmeeres' (Berlin, 1849) is repeated verbatim from the Beecheys' report. L. Cerrata's 'Sirtis' (Avellino, 1928) gives useful information for the western half of the gulf.

[2] M. Cary, 'The geographic background of Greek and Roman history' (Oxford, 1949), p. 219.

[3] The kilometre figures given here are the "official" Italian ones which appear on the kilometre stones, many of which have been mutilated or destroyed in recent years. Place-names, with one or two exceptions, are reproduced in the Italian forms which appear on all available maps of Libya.

[4] The best-preserved specimen of these Syrtic mausolea is the obelisk of Eluet el-Garoosh (Kilo 504) which Della Cella, in 1817, mistook for an ancient boundary mark between Cyrenaean and Carthaginian territory. (P. Della Cella, 'Viaggio da Tripoli di Barberia alle frontiere occidentali dell 'Egitto' (1912 edn.), p. 49.)

settlements scattered around the Gulf, and some of these expanded in the Roman period and became important. *Macomades* (which Greek mariners had called *Euphranta*) was the centre of the agricultural region of area (b), and its site is represented by modern Sirte (Kilo. 474), where there is an interesting Christian catacomb. Farther to the east there was a village called *Iscina*, with a Jewish community, which must have stood near modern es-Sultan; but the remains of an ancient city at Medeina Sultan, usually identified as *Iscina*, we found to be early Islamic in date, and to be identifiable with the city of *Sort* mentioned by several early Arab geographers.[1]

A large fortress on the promontory of Ras Ben Gawad (Kilo. 620) is very probably the *Zacasama praesidium* of the Peutinger Map, and some 3 miles inland, in the Wadi Hariga, there are extensive remains of what was probably the small town of *Digdiga*, which ranked as a municipium. From Ras Ben Gawad eastwards to the area of Agedabia, there is no difficulty in identifying the successive road-stations or coastal localities recorded in antiquity; the very scarcity of ancient sites makes the task the easier. First one encounters the small settlement of *Tugulus* (Gasr Haddadia) beside the modern road at Kilo 670 and next, some 40 kilometres farther on, the site of the famous *Arae Philaenorum*.

The story [2] of the Philaeni brothers, worthy representatives of Carthage, who elected to be buried alive to secure a favourable boundary for their country, is well known. The modern traveller, however much he may admire the noble spirit of the Philaeni, must remain a little astounded that so desolate a tract of country should have inspired such devotion. The "Altars" which the grateful Carthaginians erected to their heroes had disappeared even in Strabo's day,[3] but the name of the place remained as a memorial to the Philaeni throughout the Roman period. *Arae Philaenorum* was in fact the official boundary between Tripolitania and Cyrenaica.

During our 1951 expedition we had the good fortune to be able to establish, beyond reasonable doubt, the site of this provincial boundary. At Kilo 709, near Bir Umm el-Garanigh, we found a small Roman fort, and 4 miles inland of it, close to the foot of the Gebel el-Ala, we encountered the bases, drums and capitals of four 25-foot high Corinthian columns, each of which had originally been surmounted by a statue. The name of the emperor Diocletian on one of the drums hinted that here, as in the Roman camp at Luxor, the four emperors of the Tetrarchy were honoured by a column and statue each. Such honorific columns, when erected in desert areas, usually marked provincial frontiers,[4] and there can be little doubt that such was the case at Bir Umm el-Garanigh. The "Altars" themselves remain however as elusive today as they were in Strabo's time, and one suspects that two natural features gave rise to the legend.

On a small promontory opposite the reef of Bu Sceefa, we found the

[1] El Bekri (ed. De Slane, 1913) 13 ff; Edrisi (ed. De Goeje, 1866), 155 ff. The line of the mud-brick town-wall of Sort can still be traced, and there is much glazed pottery of early Islamic date on the surface.

[2] Sallust, 'Jugurthine War,' lxxix.

[3] Strabo, 'Geography,' iii, 5–6.

[4] *Cf.* the column of Trajan at Kheurbet el Bilaas, on the frontier of Palmyrene territory (*Syria*, 1939, 43–73).

remains of a small village which was almost certainly the *Automalax* of the Greeks and the *Anabucis* of the Romans, and marked the westernmost extent of Cyrenaean territory in the same way that *Arae Philaenorum* marked the easternmost point of Punic expansion. The seaward end of the great Sebcha Mugtaa was, perhaps prudently, left as a "no-man's-land" between the rival powers. It is interesting to note that most of the major places in the Syrtic Gulf had, in antiquity, two place-names—one indigenous and one Greek, and that the Roman road-itineraries usually give the indigenous name. The Greek sailors often named their promontories and harbours arbitrarily, without inquiring whether there was already some locally accepted place-name. The Romans, whose attitude towards native customs and traditions was more accommodating, preferred to use the local names, especially where land travel was concerned.

A few miles east of Bu Sceefa, the ruined Italian fort of Agheila (Kilo 750) marks the effective boundary of modern Cyrenaica, and a tract of plain and salt-marsh brings one to Marsa Brega (Kilo 795), the ancient *Kozynthion*, where a rocky headland, crowned by an ancient fort, gives shelter to a broad bay. Superficially, Marsa Brega gives the appearance of being the best natural harbour in the Gulf, and it was used in the nineteenth century for the export of sulphur from the deposits near Agheila. When however the Italians began to export carnellite from the marshes of Marada, the harbour they chose was the ancient one of *Arae Philaenorum*, at Ras el-Aali, where they constructed a concrete jetty.

At Marsa Brega one begins to leave the barren area of the Syrtic Gulf, to re-enter a region which was inhabited in ancient times; it has still today a considerable nomad population. The largest ancient settlement in this region was *Boreum*,[1] a village which grew up round a promontory castle at Bu Grada, 8 miles east of Brega, and had a large Jewish population. During most of the Roman period, Boreum was no more than a modest road-station, but the generals of Justinian selected it as the westernmost outpost of Byzantine Cyrenaica, and surrounded it with massive ramparts and a deep ditch. The site was discovered by the Beecheys in 1820, but only finally identified in 1950. On the edge of a marsh, a few miles inland of Bu Grada, stands the well-preserved Byzantine fort of Gasr el-Atallat; and smaller outposts (most of them probably fortified farms) are scattered in the hills for several miles around Brega. The historian Procopius [2] has explained why this region was so heavily fortified by the Byzantines. "Here," he wrote, "the mountains press close upon one another, and thus forming a barrier by their crowding effectively close the entrance to the enemy." The hills of the Boreum area hardly deserve to be called "mountains," but they are sufficiently high to give good observation across the marshes.

From Marsa Brega to Benghazi there are two routes. One, a mere camel-track, follows the coast, passing the marsh of Ain Agan, which the ancients called *Krokodeilos*. The other, followed by the modern road, goes through Agedabia. The latter place, now a flourishing and expanding town, was in

[1] A description of the site and history of Boreum appears in *Journ. Rom. Stud.* 41 (1951).

[2] Procopius, 'De aedif.' vi, 2 (translation by Dewing, in the Loeb series).

antiquity an important watering-point on the caravan route to the oasis of Augila, and was garrisoned by the Romans in the first century A.D.[1] Its ancient name seems to have been *Corniclanum*. It was still prosperous in the eleventh century, when El Bekri described it as having a mosque built by the Fatimid Caliph al-Qā'im (934–945), baths and bazaars. By the nineteenth century however, it was completely abandoned, and was only re-occupied after its establishment in 1921 as the capital of a Senussi emirate. All that has survived of ancient Agedabia is a small vaulted building which has often been described as a Christian church, but is in fact a fragment of a large fortress-palace, presumably Fatimid, which was still well preserved in the nineteenth century.[2]

Between Agedabia and Benghazi there are a number of fortified structures, including an interesting series of "Romano-Libyan" forts scattered around Ghemines [3] (the ancient *Chaminos*), and an orthodox Roman fort with angle towers at Zavia et-Tailimun. The general character of ancient settlement in these plains gives the impression of a native society, barely touched by Greek or Roman culture, settled here in the Roman period to serve as a cushion against the attacks of savage Syrtic tribes; but excavation is required before the Ghemines forts can be reliably dated. Whilst Agedabia marked the spearhead of the Roman *limes* in the Syrtica, its rear defences seems to have been on the line Tailimun—Sceleidima—Msus. The fort at Sceleidima is buried beneath an Italian successor, but we found the outpost at Zaviet Msus well preserved, its walls covered with the names of Graeco-Roman soldiers.[4] Although it is only 60 miles from the coast, it was the farthest outpost of Roman Cyrenaica, and members of its garrison evidently felt moved to leave a record of their stay in this bleak place. A trooper of the 16/5 Lancers, out on a desert patrol, had pencilled his name on the ancient walls only two hours before our own arrival, and in so doing had followed unwittingly a 2000-year-old tradition.

The Pentapolis proper, extending from Benghazi (Berenice) to Derna, took its name from the five principal ancient settlements within its confines: *Berenice*, *Tauchira* (Tocra), *Ptolemais* (Tolemaide), *Cyrene* and *Apollonia* (Marsa Suza). The sites of these cities and of ancient *Barca*, the predecessor of Ptolemais, had long been known, and excavations had been carried out by Italian archaeologists on some of them. What remained uncertain was the extent of Graeco-Roman penetration into the desert and the ancient topography of the habited areas, including the road-system, the *limes* and the distribution of villages and farms. One of our first tasks was therefore to ascertain whether there had been, as in Tripolitania, a flourishing series of frontier settlements deep in the interior. Cartography indicated that the southernmost line along which ancient buildings had been found was the track El Abiar—Charruba—Mechili, but a reconnaissance (in 1950) along this route showed an absence of Graeco-Roman remains, and indicated that we were

[1] Close to Agedabia lies the remarkable rock-cut fort of Gasr el-Heneia, described in *Antiquity*, 25 (1951) 133–140.

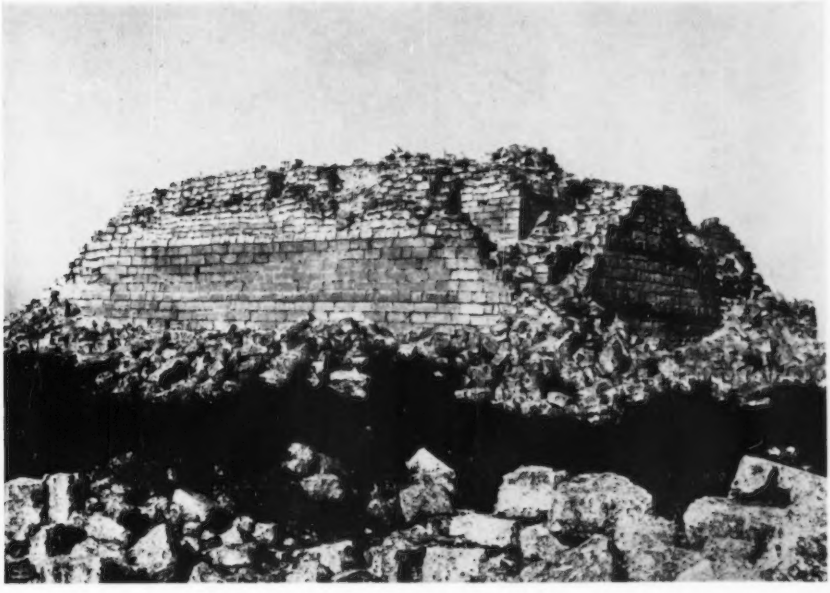
[2] J. R. Pacho, 'Relation d'un voyage dans la Marmarique et la Cyrenaique' (Paris, 1827–9) 368 and Pl. xc.

[3] *Antiquity*, 25 (1951) 141–4.

[4] The inscriptions at Msus were first reported to us by Dr. W. Hagemann, who had observed them while serving as a staff officer under General Rommel.

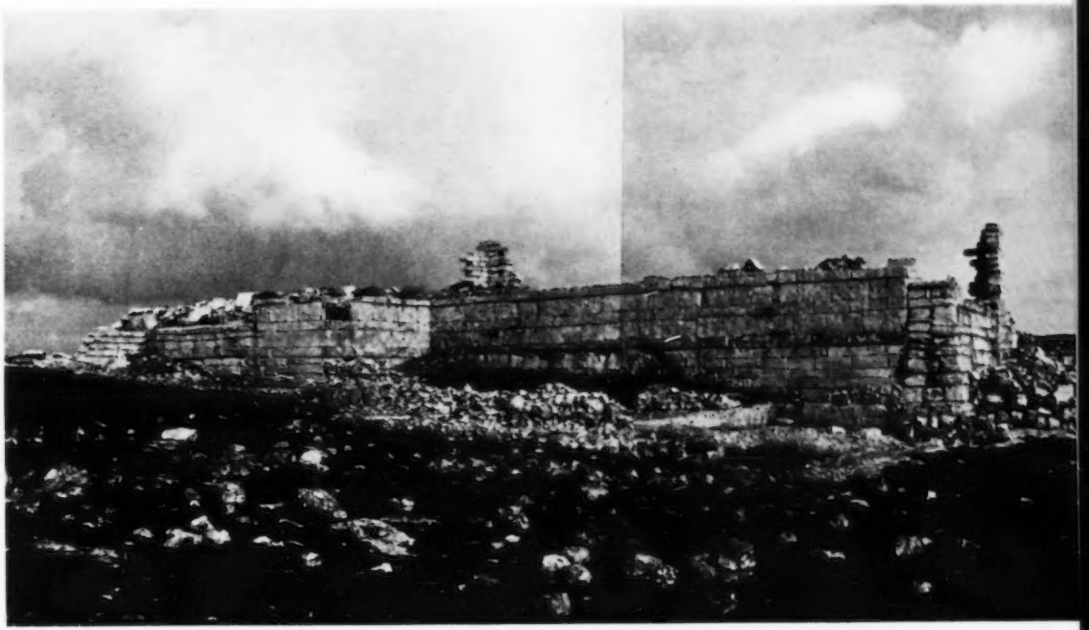
Crown copyright reserved

Roman (right) and early Islamic (left) forts at Gasr Haddadia, the ancient Tugulus



Late Roman fortress at Gasr Shahden in the Cyrenaican gebel

Ancient wheel-ruts in the rock, near Sira



Fortified Christian church at Mtaugat in the Cyrenaican gebel

well outside the area of effective ancient occupation. We did however encounter a series of mud-brick forts which we are inclined to attribute to the early Islamic period rather than to the Romans. One of these forts, at Gasr Tecasis, occupied the site of a native Libyan farm of the Roman period, and had been adapted as a turret in an Italian redoubt.[1] Close to Gasr Tecasis we found a puzzling archaeological feature, a wall of rough stones, only 70 centimetres broad, which crossed the Wadi Sammalus and then ran across open desert for some 3 miles. One can only guess that it may, like a similar wall in Transjordan, have served as an ancient tribal boundary.[2] Another mystery was a well-preserved village site, of native character, at Medinet Bu Hindi on the track from Mechili to Derna; neither pottery nor architecture have yet provided any basis for dating its impressive ruins which are certainly of considerable antiquity.

During our 1951 season we kept closer to the forest area of Cyrenaica, and followed another west–east route, the *Tariq Aziza*, which links the southernmost springs and wells of the plateau on the line El-Abiar—Maraua—Buerat (Gherrari)—Chaulan. Here we found numerous stone forts, of which the majority are roughly built and probably early Islamic, but some (Gasr Remteiat, Gasr Maragh, etc.) undoubtedly classical. There can in fact be little doubt that the *Tariq Aziza*, marking the division between forest and steppe and between springs and cisterns, also represents the approximate southern limit of Graeco-Roman occupation.[3]

In our quest for traces of the ancient routes of Cyrenaica we were as successful as we could reasonably expect to be in the limited time at our disposal. The task was not an easy one, as the old roads were not normally paved and Roman milestones are very rarely found. The routes are however marked by deeply worn wheel-ruts wherever the line of a road or track crosses a rocky outcrop, each pair of ruts being invariably one and a half metres apart, centre to centre. In many places shallow cuttings have been made, and some of the wheel-ruts give the impression of having been deliberately cut to assist traffic. Their standard gauge certainly suggests that they were not entirely accidental. From the combined evidence of these wheel-ruts, and of the Roman road-itineraries, we have been able to plot the general outline of the ancient routes in the Pentapolis. From Berenice to Ptolemais there was a single route, not far from the shore; but at Ptolemais the road forked, and there was a choice of two routes to Cyrene—a lower one crossing the wadis Meghiunes, Giargiarummah and Kuf, near their seaward extremities, and an upper one following the watershed at their heads.[4]

[1] Mud-brick was used in the construction of some Roman forts in Egypt and in southern Algeria, but in Cyrenaica and the Syrtica the use of mud-brick seems to be characteristic of the early Islamic period. The evidence of date is however still very slight.

[2] Sir A. Kirkbride, "Shebib's Wall in Transjordan," *Antiquity*, 22 (1948) 151–4.

[3] It is probable that the semi-arid region south of the *Tariq Aziza* was left to the native Libyan population, traces of whose simple hutments can be observed between El-Abiar and Charruba.

[4] The modern route from Barce to Cyrene, crossing the wadi Kuf near Gasr Beni Gdem, does not follow any well-defined ancient track. Most of the wheeled traffic of the Greek and Roman periods must have reached Cyrene via Maraua and Slonta, as did Italian wheeled traffic before 1925.

Apart from the two routes from Ptolemais, three other Roman roads converged at Cyrene, all from the east. One was the road from Cyrene's port, Apollonia, and another the road from Derna (*Darnis*) crossing the fertile Cyrenaican plateau. The third road, recorded on the Peutinger Map, ran in an almost direct line from the Gulf of Bomba to Cyrene, and was the shortest route from the latter city to the Egyptian frontier. *Agabis* (Ghegab) was one of its road-stations, and *Mandis* (Gasr Carmusa) another. The latter site, on the plateau of Dahar el-Ardam, 20 kilometres south of Derna, is marked by some massive Greek tombs, and a small pseudo-peripteral temple. The main road-station in the Gulf of Bomba was *Paliurus*, which must have been situated near the mouth of the wadi Tmimi. We were not however able to visit and identify it.

The plateau, both to east and to west of Cyrene, is full of ancient sites, some of them extensive villages, others fortified farms and towers. There are several Christian churches, as at Lamluda (ancient *Limnias*) and Mtaugat, near Tert, where ditches and thick revetment walls show these buildings to have been strongly fortified. It is evident that in the days of Bishop Synesius, when the Pentapolis was ravaged by savage Libyan tribes, the church of each small village, by virtue of being its most substantial building, became its citadel. Life in the Pentapolis must have been difficult and dangerous then, for the invaders, anticipating the tactics of Omar Muktar in 1925–30, infiltrated into the deep ravines of the wadi Kuf and cut the province in two.[1]

In one of his letters Synesius describes a journey which he made from his see of Ptolemais to the area of Derna, in order to settle an ecclesiastical dispute. The Bishops of Derna and Erythrum were, it seems, contesting the ownership of an old fort at a place called *Hydrax*, and Synesius was obliged to intervene, as Metropolitan of the province. It is evident that Hydrax lay inland somewhere mid-way between Erythrum and Darnis, and the most likely site seemed to be Ain Mara, the abundant springs of which place would explain its ancient name. On visiting Ain Mara we found on a hill above the springs a massive Roman fort, its walls twisted and overturned by an earthquake exactly as described by Synesius in his letter.[2]

On the coast of Cyrenaica there were a number of small villages and harbours, the approximate sites of which can be determined from the distance figures given in the 'Stadiasmus Maris Magni'; and in most instances there are archaeological remains to support the identification. The site of *Erythrum* lies at the mouth of the wadi el-Atrun where "springs of pure, sweet water gush forth on the very shore," as described by Synesius. There we found the remains of a small church, with marble columns and capitals. *Phycus*, the small port which Synesius used for the despatch of letters to his numerous overseas friends, is represented by extensive ruins at Zaviet Hammama north of El-Hania. The promontory of *Phycus*, which the ancients considered to be

[1] The wadi Kuf region is admirably suited for guerilla warfare, and General O. Mezzetti's remarks in his memoir 'Guerra in Libia' (Rome, 1933) 156–9, should be read by anyone interested in the military problems of the period of Synesius.

[2] Synesius, 'Letters' (Edited by Fitzgerald), 67. We were unable to identify with confidence the village of *Palaebisca* which shared a bishop with *Hydrax*. It could have been at Bet Tamer or at Zaviet Marazigh, at both of which sites there are extensive remains.

the northernmost in Cyrenaica, was not the modern Ras Aamer, but the small headland which shelters the bay of Zaviet Hammama.[1]

One or two major sites are still rather elusive. *Hadrianopolis*, a settlement founded by the emperor Hadrian in his attempt to repopulate Cyrenaica after the heavy casualties of the Jewish revolt, is usually supposed to have been at Driana, a small village between Benghazi and Tocra. Despite the suggestive place-name, we could find no convincing remains of an ancient settlement at Driana, and have been forced to the conclusion that the real site was at Tansoluch, 5 miles nearer Tocra, where there are at least the remains of an extensive village. It seems in fact that attempts to establish new urban units in the Pentapolis during the Roman period failed to meet with success; even the original five cities never expanded beyond their Ptolemaic city walls. On the other hand, rural settlement became much more intensive during the later Roman period, and it is certainly mistaken to interpret the history of Roman Cyrenaica as one long period of decline.[2]

Our general conclusions may be summarized as follows:

(1) The lines of communication in ancient Cyrenaica ran from east to west, rather than from south to north. Professor Cary is correct in saying that "Cyrenaica in ancient times was never the terminal region of a caravan route."[3]

(2) The scarcity of water south of the forest belt on the Gebel el Akhdar discouraged the Romans from establishing settlements deep in the interior.

(3) The greatest menace to the peace of Cyrenaica during the Roman period came from the Syrtic region, and the approaches from that region were guarded both by forts and by settlements of *limitanei*.

(4) Invaders who had breached the outer defences could take advantage of the deep wooded ravines of the wadi Kuf area to penetrate into the most fertile and populous regions. The massive late Roman forts (Gasr Beni Gdem, Gasr Sciahden, etc.) in the Kuf area represent an "inner *limes*" designed to prevent the province being cut into two.

Despite the gloomy predictions of Synesius, whose initial attitude of courageous resistance later turned to despair,[4] Libya did in fact survive the attacks of her African invaders. The Austurians overran the country in 410 and in 450, the Mazices in 510; yet the cities remained occupied, and Byzantine administration continued. It was only in A.D. 643 that the new

[1] The ruins at Zaviet Hammama, and elsewhere in the little-known region between Cyrene and Ras Aamer, were examined during our 1950 season by Messrs. D. Smith and P. Titchmarsh. See also Freya Stark, "The coast below Cyrene," *Geographical Magazine*, December 1950.

[2] The cultural decline of Cyrenaica was mainly due to the rise of Alexandria as the intellectual centre of the Levant; but the country did play a large part in the development of the Arian heresy. Arius himself is said to have been of Libyan origin, and he was supported by several Cyrenaican bishops.

[3] M. Cary, *op. cit.* 218. The caravan track from Augila to Benghazi, via Agedabia, was never as important commercially as the routes which linked the Fezzan with the ports of the Tripolis.

[4] Synesius, 'Essays and Hymns' (Ed. Fitzgerald), Vol. II, "Catastasis." Invaluable and attractive as they are, the writings of Synesius give only one side of the situation in the Pentapolis. His portraits of contemporary officials and generals are coloured by personal animosity.

Arab invaders, under the command of Amr ibn al Asi, put an end to Roman rule in Libya.

It need hardly be stressed that the two expeditions of the Map of Roman Libya Committee have been sufficient only to give a broad overall picture of the extent and character of Roman occupation in eastern Libya. It would require many years of work, and many workers in the field, to produce a detailed archaeological survey of the whole area; and, in the absence of inscriptions, excavation is required if we are to be able to date the numerous forts and farms scattered throughout the countryside. Meanwhile however the compilation and publication of a provisional map of Roman Libya, based on previous discoveries and on our own rapid long-range reconnaissances, may serve as an aid to students, and as a stimulus to further research.

Since the above paper was written, further information has come to light regarding two of the ancient settlements to which I have referred, *Iscina* (p. 146) and *Hadrianopolis* (p. 151).

Air photographs have revealed a singularly complex series of ancient field-boundaries stretching for two miles west of Medina Sultan. The site of Iscina was therefore probably a little west of the Islamic city of Sort. Mr. C. N. Johns, Controller of Antiquities in Cyrenaica, informs me that some ancient remains have been found between Driana and the sea. Further investigation may determine whether these, or the ruins at Tansoluch, mark the site of Hadrian's city.

BRITISH GEOGRAPHY AND THE AMERICAN GEOGRAPHICAL SOCIETY, 1851–1951

J. K. WRIGHT

"IN NO SMALL measure in our growth in the noble science of geography we owe you a debt. In debt as we are to the geographers of France, to the geographers of Germany, to the geographers of Italy, and many other lands, the Royal Geographical Society has been to us a living spring of exploration and of power." [1] On 23 October 1930, at the Centenary Dinner of the Royal Geographical Society, Professor Albert Perry Brigham spoke these words on behalf of the geographers of the United States and particularly of the American Geographical Society, which he was representing. The latter is now celebrating its own Centenary.[2] Throughout its history it has maintained close and cordial relations with Great Britain,[3] with British geographers, and with the Royal Geographical Society. Characteristic aspects of this relationship are described in this paper.

The Franklin Search and the A.G.S.

On 26 July 1845, Sir John Franklin's ships were seen for the last time near the entrance to Lancaster Sound. Their disappearance may well have been one of the factors that brought about the founding of the American Geographical Society. Plans for its formation were first discussed in 1850, but with one exception (George Folsom) the names of those who participated in the discussion are not on record. Henry Grinnell, shipowner and philanthropist, was however undoubtedly a leader among them, for he was elected president of the new society when it was initially organized a year later. In 1849 Lady Franklin's appeal for American help in the search for her husband

[1] *Geogr. J.* 76 (1930) 543–44.

[2] Many of the facts considered in this paper are also discussed in other connections in the writer's book, 'Geography in the making: The American Geographical Society, 1851–1951' (published by the Society, New York, 1952). Nowhere in the book however are they correlated in such a way as to give a unified conception of the subject with which the paper deals, and the paper is also based in part on information that will not be found in the book. Footnote references to publications of the American Geographical Society are in general omitted, since most of the pertinent material may be located by consulting either the index to 'Geography in the making,' A. A. Brooks' 'Index to the Bulletin of the A.G.S., 1851–1915,' or the decennial indexes to the *Geographical Review* covering 1916–25, 1926–35, and 1936–45. For a short survey of the Society's history see J. K. Wright, "The American Geographical Society, 1852–1952," *Scientific Monthly*, 75 (1952) 121–131.

[3] Since it would be impossible in a paper of this length to deal adequately with the relationships between the Society and the British Commonwealth and Empire as a whole, I have limited the paper's scope to the Society's relationship to Great Britain and its people. Reluctantly therefore, I omit discussion of contacts that the Society has maintained with other parts of the Commonwealth and of its especially fruitful contacts with the Australians, Sir Hubert Wilkins, Dr. A. Grenfell Price and Mr. M. Aurousseau.

and his men had touched Mr. Grinnell's heart, and in 1850, at or about the time when the Society's founding was under consideration, he equipped and paid most of the cost of Lieutenant E. J. De Haven's expedition to look for the missing British explorers.

During this period the subject was an extremely "live" one in New York. The founders of the Society included several newspaper men, who had often seen to it that both news of the search and editorial speculations regarding Franklin's fate were published in their papers. It therefore seems likely that the heightened interest in the Arctic regions thus aroused in the minds of Grinnell and other New Yorkers added urgency to their conviction that a society devoted to the advancement of geographical knowledge was needed, especially since no such institution then existed in the United States. At a meeting held on 9 October 1851, the new society was launched and named "The American Geographical and Statistical Society of New York." It retained this title until 1871, when the words "and Statistical" were eliminated.

Mr. Grinnell was the Society's most esteemed and influential member during the 'fifties and early 'sixties. He followed maritime events and Arctic exploration with close attention, and was recognized as an authority on these subjects. The Society has in its library eight voluminous scrapbooks of newspaper clippings which he kept over many years, a valuable record of oceanic and polar lore. Both his business and his avocation brought him countless friends and correspondents in British circles. After backing De Haven in 1850, he gave financial support to three further ventures in quest of Franklin, Dr. Elisha Kent Kane's expedition (1853–55) and Charles Francis Hall's first two voyages (1860–62, 1864–69), and he also contributed toward Dr. Isaac Israel Hayes' North Polar attempt (1860–61). The British public was profoundly touched by his efforts in behalf of Franklin, and especially when he took the lead in bringing about the return to their Government of the *Resolute*, one of Sir Edward Beecher's ships which had been engaged in the search, then abandoned in the Arctic, and later salvaged by an American whaler, Captain J. M. Buddington, in 1855.

Although the American Geographical Society did not advance funds of its own to the expeditions of Kane, Hayes and Hall—it had next to none—the Society endorsed them, set up committees to help their leaders raise money, and thus in a sense was their sponsor.

Hall's journeys of 1860–62 and 1864–69 were made with Eskimos only as his companions. On the first, though bound for the regions north-westward of Hudson Bay where he hoped to get in touch with survivors of the Franklin expedition, he was unable to proceed farther west than Frobisher Bay. Here he made the important discovery that the Bay is not a strait, as previously thought, and also found relics of Sir Martin Frobisher's sojourn there in the sixteenth century, which he brought back with him to New York. The relics were put on exhibit for a while in Mr. Grinnell's house and later sent to London in the care of Mr. Grinnell's son, Cornelius, where they were donated "to the British people, through the Royal Geographical Society." Later Rear-Admiral Richard Collinson described them in a new edition of Frobisher's voyages that he prepared for the Hakluyt Society and dedicated to Henry Grinnell. During his second journey Hall found silver plate, skeletons, and

other relics of Franklin's men on King William Island; one of the skeletons was sent to England.

In 1864 Charles Patrick Daly, a son of poor Irish immigrants to New York, was elected President of the Society, to hold this office for thirty-five years. Daly was both a revered judge and an erudite student of geography and of the history and current progress of exploration. Although active in Hibernian organizations, he was without anti-British prejudice and, like Grinnell, counted British explorers and geographers among his friends, guests and correspondents. He dominated the Society's affairs during most of his Presidency and did much to establish the institution's finances, and also its scholarly tradition, upon firm foundations. In 1878, after hope of finding survivors of the Franklin expedition had long been abandoned, a report that Eskimos had come across "a book" on an island in the Gulf of Boothia, possibly a missing Franklin record, stimulated his interest; and through his initiative the Society raised funds from among its members for an expedition conducted by Frederick Schwatka and William H. Gilder during the years 1878–80. Although the story of the book proved to be a fable, the expedition visited King William Island where more relics of Franklin's party were collected and new information about its fate gleaned from the Eskimos. The relics were presented to the British Government.

Thus a tragic event in the annals of British discovery may well have been a powerful factor in the founding of the American Geographical Society. The heroic sequel to this event unquestionably helped cement enduring bonds between the Society and Britain.

The R.G.S. and the A.G.S.

Until about the time of Schwatka's expedition the Society was a modest little organization. Some of its members looked upon the Royal Geographical Society with wistful envy, as their ideal of what a geographical society ought to be. The adoption of the term "Council" for the governing board in 1854 may have been suggested by the British precedent. During the Civil War, "following the example of the Royal Geographical Society," the Council invested its Secretary "with responsibility for most of the correspondence and all of the financial action of the Society." The minutes record that soon after his election as President in 1864 Judge Daly referred the Council "to the paper read by the Secretary at the meeting of the Society on 6 Oct. as a most interesting paper on the interior of China." He explained that "such a paper ought to have drawn 300 persons to its reading, would have done so if it had been before the Royal Geo. Soc.; at our meeting only 10 or 12 present. . . . Mr. Cyrus W. Field [promoter of the trans-Atlantic cable] noted that at the meetings of the Royal Geog. Soc. there were often 2500 persons present at Burlington House." Owing partly to the war, the Society in New York was entering the doldrums at this time, after a vigorous start during the 'fifties. A decade later, through the efforts of Judge Daly and others, it had recovered its vitality and was holding meetings that rivalled those of the Royal Geographical Society in attendance. In 1874, upon the recommendation of Francis Aquila Stout, a gentleman of culture, cosmopolitan tastes and wide travels who had recently returned from Europe, the two pre-existing classes

of Resident and Non-Resident Members were replaced by a single class of "Fellows." Thus, none too subtly perhaps, did the American Geographical Society again follow the example of the Royal Geographical Society. The term "Fellow" did not however bring to the former an immediate prosperity commensurate with that of its sister. In 1880 Judge Daly pointed out that the Royal Geographical Society was then receiving an annual income of $40,000. He failed to state the annual income of the American Geographical Society, but it was about a quarter as much, and the Society had almost no capital. "Surely," grieved the Judge, "this is as useful a work to promote by gifts and bequests as it is to endow colleges."

Emulation was not confined to the nineteenth century. In 1922 Dr. Alexander Hamilton Rice, a member of the Council, established a School of Surveying at the American Geographical Society. His explorations in South America had brought him into close touch with the Royal Geographical Society where Mr. E. A. Reeves was giving instruction in survey methods adapted for use on exploring expeditions. Dr. Rice felt that enough Americans were carrying on explorations to justify the American Geographical Society in offering similar instruction. Two young men who had taken the full course under Reeves, O. M. Miller of Perth, Scotland, and an American, Weld Arnold, were appointed instructors. The School was maintained as such until 1932, when Dr. Rice and Mr. Arnold withdrew. Mr. Miller has remained on the Society's staff to this day. The School and the departments that grew out of it combined teaching with original investigations until the late 'thirties, but their primary concern has been with research. Arnold's contributions to astronomical geography and the studies of Miller, W. A. Wood and W. O. Field in cartography, photogrammetry and exploratory techniques have formed an American counterpart of the work of Reeves and Hinks.

For an American there is solace in noting that the tables would appear to have been turned in 1948 when the Royal Geographical Society inaugurated a "Research Series" of publications [1] (the American Geographical Society having done so in 1921) and again in 1946 when the London society named Mr. Kirwan its first "Director." This title the American Geographical Society had conferred upon Dr. Isaiah Bowman in 1915 when it enticed him away from a professorship of geography at Yale University to put him in charge of its staff, a move that gave new life and strength to the institution.

Besides emulating one another, the two societies have often exchanged courtesies and at times have worked in cooperation. Four months after Judge Daly's death in 1899 the American Geographical Society held a meeting in his memory, at which a venerable Vice-President spoke of the Judge as "so well known as an authority in geographical science" and so highly respected "that a letter of introduction from him to the leading Geographical Society of the world—I refer particularly to the Royal Geographical Society of London—would secure the bearer all the consideration and attention he could reasonably desire." Along with the Duchess of Bedford and others, the societies joined in sponsoring the "Anglo-American Arctic Expedition" of Ejnar Mikkelsen and Ernest De K. Leffingwell of 1906–11, on which

[1] The *R.G.S. Research Series* is a development from the earlier *R.G.S. Technical Series*, the first volume of which was published in 1920.—*Ed. G.J.*

Vilhaljmur Stefansson had his initiation in Arctic exploration. In 1922, Mr. Edward Heawood, Librarian of the Royal Geographical Society, gave the writer of this paper constructive criticism on a bibliographical work then in preparation for publication by the American Geographical Society. An especially interesting example of cooperation arose in connection with a rather scrappy succession of snapshots taken by Lincoln Ellsworth on his trans-Antarctic flight in 1935. From these W. L. Joerg, O. M. Miller and William Briesemeister of the American Geographical Society constructed a map which was published in the *Geographical Review* in 1937. It shows the outlines of a depression, designated "flat plain, sea or shelf ice." Mr. Joerg thought that this might be the icy surface of a long and narrow indentation of the coastline. Within two years the correctness of his assumption was dramatically established by the British Graham Land Expedition, which explored the feature by sledge and from the air and named it King George the Sixth Sound. When the Royal Geographical Society came to work up the results of the Graham Land Expedition, Mr. Hinks asked the American Geographical Society for the loan of Ellsworth's original photographs and they were sent to London. Impressed by the close correspondence of the coastlines as shown on the American Geographical Society's map and as later established by the accurate surveys of the Graham Land Expedition, the Royal Geographical Society generously published a special map in the *Geographical Journal*[1] on which the two delineations may be readily compared.

It would be misleading to leave the reader under the impression that the societies have never engaged in sisterly bickerings or that the American Geographical Society has never published anything that could give offence to British sensibilities. Fortunately, such unpleasantnesses have been infrequent, have not occurred in recent years, and can be mentioned today with amusement untinged by irritation. In nearly every case they had their roots in national pride.

At the "First Public Sitting" of the American Geographical Society in January 1852, Edward Augustus Hopkins, American Consul to Paraguay, read a paper on that country, in which he excoriated the British for what he regarded as the baneful effects of their commercial policies along the Rio de la Plata. As published in Volume 1, No. 1, of the Society's *Bulletin*,[2] his remarks offended Sir Roderick Murchison who, in an address before the Royal Geographical Society (of which he was then President), branded Hopkins' "invidious allusions" to Great Britain as "ill-suited to the halls of science." "In no instance," said Sir Roderick, "have geographical or any other scientific institutions of our country introduced similar comparisons; on the contrary, we have always striven to promote the harmony of nations, and especially between the United States and ourselves. I feel confident, therefore, that a Society presided over by those distinguished men, Bancroft

[1] *Geogr. J.* 96 (1940) facing page 233.

[2] Before 1916 the Society's periodical was entitled variously *Bulletin*, *Journal*, or (1862–1865) *Proceedings* (for details see Brooks, *op. cit.*, p. xi); since 1916 the title has been *The Geographical Review*. In referring to it in a general manner in this paper I use either the term "journal" or, for the period before 1916, *Bulletin*.

and Grinnell, will keep its future communications free from all political disquisitions."

It may be noted in passing that George Bancroft was President of the American Geographical Society at this time, personal reasons having obliged Mr. Grinnell to decline the office when elected to it in October 1851. Mr. Bancroft, author of a monumental 'History of the United States,' had served from 1846 to 1849 as American Minister to Great Britain and was one of a number of diplomats on the Society's governing board during its early years.[1]

In spite of Sir Roderick's appeal, the Society's deliberations and publications did not remain wholly uncontaminated by "political disquisitions" at Britain's expense. In 1864 the Reverend Dr. Joseph P. Thompson, Vice-President, cautioned the Council that "on the subject of the Sandwich Islands we ought to see that our Government is made aware of and advised to keep an eye to the encroachments doubtless contemplated by the British Government in that quarter"; twenty years later Judge Daly expressed distaste for Britain's action in concluding a formal treaty with Portugal by which the sovereignty of the latter was recognized over the area around the mouth of the Congo; and other examples could be cited.

Sir Roderick Murchison's discomposure was reciprocated in 1877. In his annual address before the American Geographical Society, Judge Daly took the Arctic explorer, Sir George Nares, to task for "want of courtesy and kindliness towards his American predecessors." The point at issue sprang from that perennial source of ruffled feathers in matters of polar geography—the question of the recognition of the work of earlier explorers of different nationalities and of the names on their maps. After reading the address, Mr. (later Sir) Clements R. Markham, Honorary Secretary of the Royal Geographical Society, wrote to Judge Daly: "I was sorry Sir George Nares made any remarks on the errors in the work of Kane and Hayes in his Report, as there could be no use in it; but I also regret that you should have entered so fully upon the matter. . . ." After a few days however, Daly received a letter in which Nares wrote: "in common with all arctic navigators I have the highest admiration for the very valuable work performed by Dr. Kane and Dr. Hayes under great difficulties—considering these difficulties, the general accuracy of their charts leaves little to be desired or criticized. I merely complain of the original names being altered." The storm blew over, and five months later Markham informed Daly that "Sir George Nares thinks it desirable that the peninsula formed by Archer Fiord on one side and Kennedy channel on the other should have a special designation, and it is his intention to call it Daly Peninsula in recognition of your geographical eminence." The Judge was mollified, and the peninsula has borne his name ever since.

Conversely, a few Americans during the present century have been exercised over what they considered as British disregard for the claims of Palmer and Wilkes to prior discoveries in the Antarctic. In 1909–10 the Council of the American Geographical Society endorsed a movement to bring about a government-sponsored expedition to explore Wilkes Land. One purpose was to vindicate Wilkes, upon whom the British were alleged to have cast "slurs."

[1] Among them there was another historian, John Romeyn Brodhead, who had served under Bancroft as Secretary of the Legation in London.

The American Government was however not then in a position to undertake Antarctic ventures. Edwin Swift Balch, a member of the American Geographical Society's Council from 1912 until his death in 1927 and an authority on the history of exploration, and more recently Professor W. H. Hobbs of the University of Michigan, have championed Wilkes and Palmer in the Society's journal and other periodicals. The claims for Palmer have had an ardent advocate in Colonel Lawrence Martin, formerly of the Library of Congress, and also a redoubtable opponent in the late Mr. Hinks. In the interests of impartiality the American Geographical Society in 1941 published a reply by Hinks to an earlier paper by Martin, together with an answer by the latter.

Such flies have not however vitiated the generally prevailing sweetness of the ointment. Volume 1, No. 1, of the *Bulletin of the American Geographical Society* contained two items that, no doubt, largely counteracted the disagreeable impact upon British sensibilities of Hopkins' "invidious allusions" in the same number. One was an excerpt from a treatise by William John Hamilton, a former President of the Royal Geographical Society (1847–49), the other a letter from Dr. David Livingstone. The first was reprinted from a 'Manual of scientific enquiry' that Hamilton had prepared for naval officers and "travelers in general." "As the study of the science of geography has of late years advanced," he pointed out, "it has also risen in public estimation." The making of maps is but its commencement, and "the most perfect maps are but" its "skeleton or groundwork. . . . No doubt the commercial intercourse of mankind is facilitated and kept up by these maps and charts; but we should aim at a higher object in the study of geography, viz. the improvement of man's moral culture, by a more extended knowledge of the productions of different climes, and by bringing before him, on a large, tabular scale, the moral and physical condition of his race."

Livingstone's letter, written "on the banks of the Zouga" and addressed to his brother in Massachusetts, told of journeyings in the vicinity of Lake Ngami. Somewhat later its writer was elected, first, a Corresponding Member and then an Honorary Member of the American Geographical Society. Moved by these testimonials, Livingstone wrote two more letters to the Society, which were read at meetings and published in the *Bulletin*. After his death the Society held a special meeting in his memory, something that it has done only for Alexander von Humboldt, Karl Ritter, Judge Daly, and perhaps one or two others. At least 2500 Fellows and guests are reported to have attended the Livingstone Meeting. Solemn eulogies were spoken and the United States Army Band played dirges at intervals during the evening.

Until the establishment of funds for the award of the Cullum and Daly gold medals in the late 'nineties and early nineteen hundreds, election to Honorary Membership was the highest regularly authorized honour that the American Geographical Society was in a position to confer. Although the Society favoured a number of Americans in this way during its first fifty years, most of those elected were Europeans and especially Britons. Besides Livingstone, the latter included Sir Austen H. Layard, Sir Samuel White Baker, Sir George Nares, and four men who stood high in the counsels of the Royal Geographical Society and served at one time or another as its

presidents, Sir Roderick Murchison, the Earl of Dufferin, Sir Henry Creswicke Rawlinson and Sir Clements R. Markham. Since 1900 the American Geographical Society has awarded medals to 102 explorers, geographers and others who have made notable contributions to geography. Forty-one of the recipients were Americans, the British ranked second with 23 (Great Britain, 17; Australia, 4; Canada, 2), and France third, with 8. Four of the medals were awarded to men whose names are indissolubly associated with that of the Royal Geographical Society: Sir John Scott Keltie (Secretary, 1894–1915), Arthur R. Hinks (Secretary 1915–45), Dr. Hugh Robert Mill (Librarian, 1892–1900), E. A. Reeves (Map Curator, 1900–33) and J. M. Wordie (President 1951–). In 1941 the Royal Geographical Society bestowed its Patron's Medal upon Dr. Bowman, chiefly in recognition of his services to geography during his twenty years as Director of the American Geographical Society. When the presentation was made some years later in London, he delivered an address on "The Geographical situation of the United States in relation to World policies." [1]

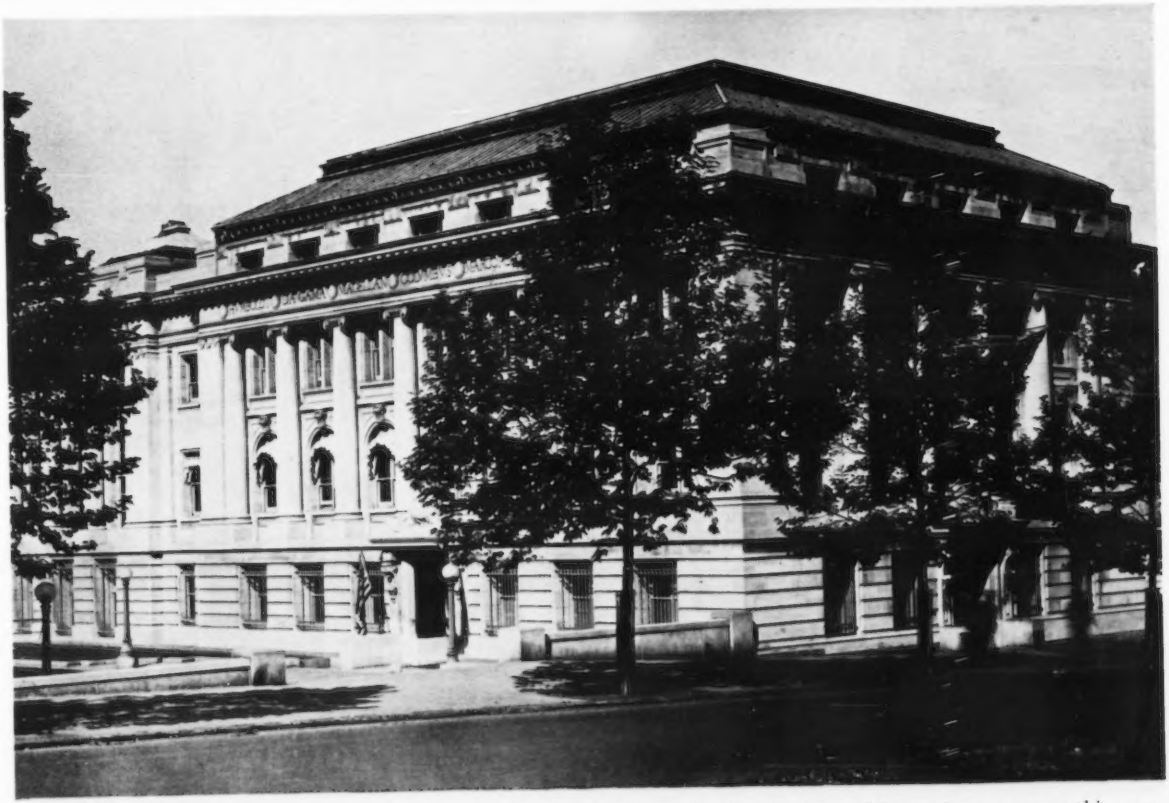
Except for two years in the late 'sixties, when its fortunes were at a low ebb, the American Geographical Society has held an annual course of lectures since 1851. Naturally, most of the speakers have been Americans, and in the period before 1900 Americans formed an overwhelming majority among them. During that period however, the Society had the privilege of hearing no less a figure than Henry M. Stanley, for whom it gave a reception in 1872, and of welcoming two earls upon its platform, Lord Dunraven who spoke on "Moose and caribou hunting in Colorado and Canada," and Lord Dufferin, author of 'Letters from high latitudes' and later President of the Royal Geographical Society (1878–79). Governor-General of Canada at the time of his visit to New York, Lord Dufferin was guest of honour at a meeting of the Society called to discuss a proposed expedition to the North Pole. After this business had been transacted he was unanimously elected an Honorary Member, and in a gracious speech said: "Our discussion to-night has been concerned with those snow-covered lands which lie beneath Arcturus and are lighted by the radiance of the aurora. And I do believe that, if I am paraded before you to-night, it is because my friend, Judge Daly, wished to show you a potentate whose sceptre touches the pole, and who reigns over a larger area of snow than any other monarch of the earth. [Laughter and applause.]"

During the present century, British explorers, mountaineers and geographers have made more frequent appearances before the Society, among them Dr. and Mrs. W. H. Workman, Sir Ernest Shackleton, Edward Whymper, Sir Percy Sykes, Rosita Forbes, Bertram Thomas, Dr. D. G. Hogarth (President of the R.G.S., 1925–27), Freya Stark, and Professors H. J. Fleure and L. Dudley Stamp.

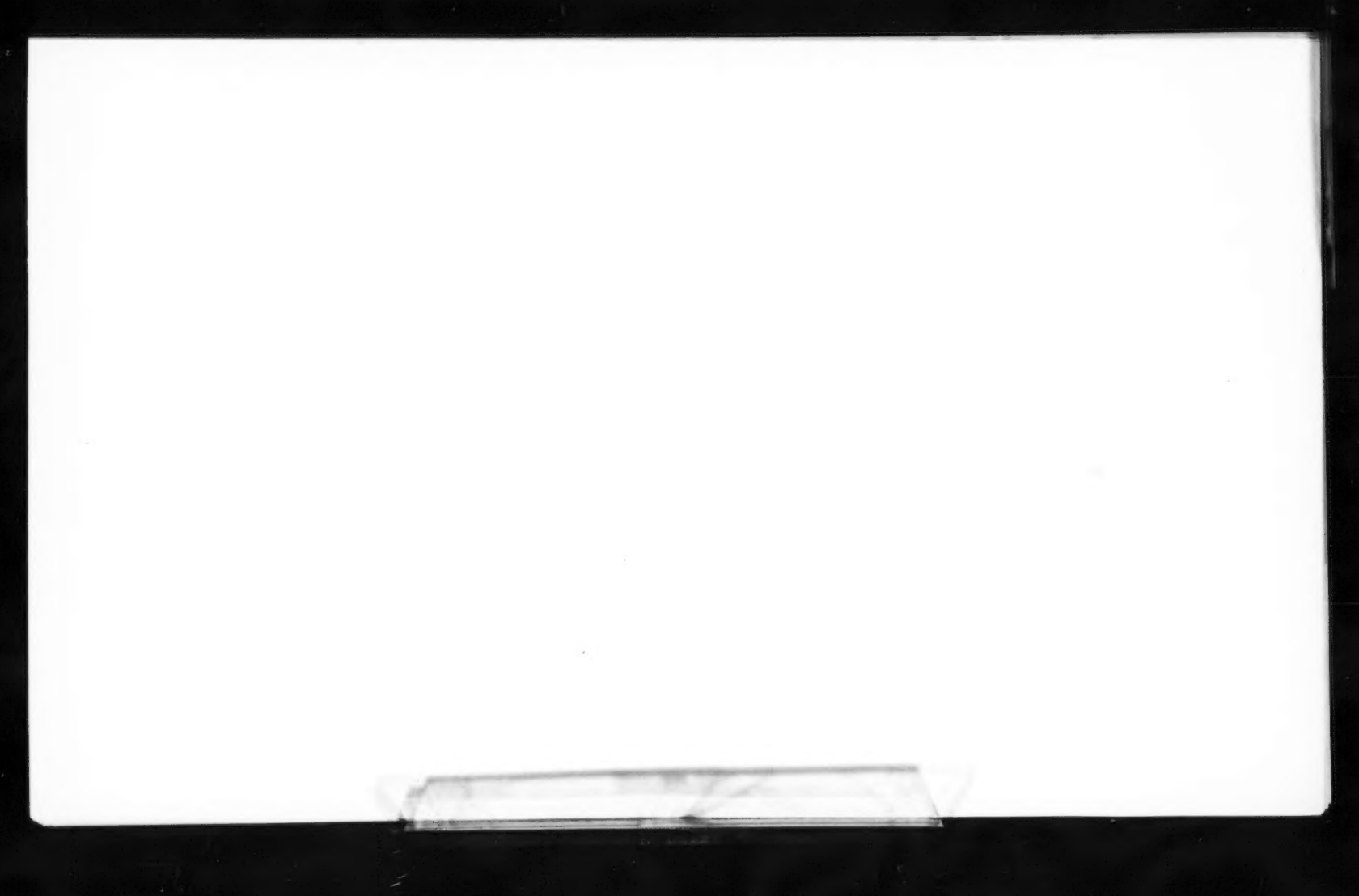
A.G.S. commentaries on British geographical work

Scientific societies serve one of their most useful functions by publishing information and critiques concerning what is going on in their special fields of interest. Until the 'seventies, the American Geographical Society was not

[1] *Geogr. J.* 112 (1948) 129–45.



The Headquarters of the American Geographical Society, New York. The Society celebrates its centenary this year



able to do this, except in a somewhat sporadic manner. During that decade however, Judge Daly delivered a series of masterly annual addresses before the Society on "The geographical work of the World," which, as published in the *Bulletin*, kept its readers, if not fully informed of all, at least well informed of important, aspects of that work. The addresses dealt principally with the progress of exploration and laid much stress on the activities of British explorers. Since 1885 the Society's journal has contained departments devoted to reviews and notes on events of current geographical interest, and in these also the progress of British exploration has received consistent attention.

The reviews and notes were inaugurated by George C. Hurlbut, an able and systematic scholar, soon after his appointment as Librarian of the Society and editor of the *Bulletin*, a joint position that he held until his tragic death in an automobile accident on Christmas Day, 1908. At first Mr. Hurlbut himself wrote nearly all of them, but as they increased in quantity other persons were asked to collaborate. They began to appear simultaneously with the growth of new geographical interests in Britain. In the mid-eighties the Royal Geographical Society carried out a comprehensive investigation of the status of geographical education in its own and other countries. That Society's recommendations led to the introduction of geographical instruction at Oxford and Cambridge and ultimately at other universities. Mr. Hurlbut sensed the importance of this movement and sought to keep the readers of the *Bulletin* in touch with its main developments. The example thus set before them gave inspiration and encouragement to American geographers in their own struggle to raise standards and to gain recognition for geography as worthy of a place in institutions of higher education.

Through Dr. Bowman's initiative the title of the Society's journal was changed from *Bulletin of the American Geographical Society* to *The Geographical Review* in January 1916, six months after he had taken office as Director. He also put into effect measures designed "to broaden the range and deepen the intellectual interest of its articles and to give its notes and reviews a more critical and scholarly quality." His motives were similar to the ones that had led the Royal Geographical Society in 1893 to adopt the title *The Geographical Journal* for its own periodical and at the same time to strive "for more attractiveness in the form, more artistic excellence in the illustrations, and a higher literary standard in the presentation of the facts of Geography." [1]

In the record and book review departments of the *Geographical Review* the stream of commentary on British undertakings became more voluminous than it had been in the *Bulletin* and the comments more discerning. Also, on occasion, the editors would ask British writers to review the work of Americans if the former were believed to be the most competent authorities available or if bias seemed unavoidable on the part of American reviewers. Sir Napier Shaw's inimitable observations on certain meteorological works and Professor E. G. R. Taylor's incisive critiques of a number of textbooks may be cited as examples. The American Geographical Society has moreover

[1] Hugh Robert Mill, 'The Record of the Royal Geographical Society, 1830–1930,' London, 1930, pp. 242–43.

published at least three general, though short, discussions of the status of geography in Britain: Sir John Scott Keltie's 'The position of geography in British Universities' (1921), in its *Research Series*, and, in the *Review*, the sections on Britain in Joerg's comprehensive paper on "Recent geographical work in Europe" (1922) and, from a more recent era, L. O. Wilson's "Some observations on wartime geography in England" (1946).

British contributions to A. G. S. publications

Although the progress of British geographical work was frequently commented upon in the *Bulletin*, the Society published few actual specimens of this work before 1915. Among those that did appear, three pronouncements on the nature of geography deserve mention.

In 1904 Dr. Hugh Robert Mill attended the International Geographical Congress in the United States and also delivered a paper at the St. Louis World's Fair on "Present problems of geography," which was published in the *Bulletin*. As a new definition he suggested: "Geography is the science which deals with the forms of relief of the earth's crust and with the influence which these forms exercise on the distribution of other phenomena." Six years later the *Bulletin* reprinted the greater part of an address by Professor A. J. Herbertson before the British Association for the Advancement of Science on "Geography and some of its present needs." "The search after geographical unity," he had said, "after general features common to recognizable divisions of the earth's surface, the analysis of these, their classification into types, the comparisons between different examples of the types—these seem to me among the first duties of a geographer."

Mill's conception of geography as concerned primarily with environmental influences, and Herbertson's of geography as the study of regional complexes did not come as revelations to American geographers. Both had their advocates in this country at the time, though the statements by their British proponents must have helped reinforce the convictions of their American devotees. A third British view, that of Colonel (later Sir Charles) Close, also brought to the attention of American readers through its reprinting in the *Bulletin* (1911), probably met with a less enthusiastic reception. A distinguished geodesist and later President of the Royal Geographical Society, Colonel Close did not undertake to define geography, but rather, on the basis of a statistical analysis of the articles in the *Geographical Journal* (1906–10), not only expressed the opinion that "Geography is not a unit of science in the sense in which geology, astronomy, or chemistry are units," with which many geographers might agree, but reached the less congenial conclusion that the function of geographical societies should be "to popularize the work of geodesists, geologists, climatologists, and others, and to provide a common meeting ground for them." Rebuttals by Dr. Martha Krug Genthe and Dr. Mill were published in the *Bulletin*.

Many years later, in 1948, the breadth, the judgment and the style of another address before the British Association inspired the editor of the *Geographical Review* to make an exception to an unwritten rule excluding previously published matter from its pages. The address, by Professor E. G. R. Taylor, was on "Geography in War and Peace," and in it she pointed

out "that the consequences of the regional differentiation of the world's surface, or in simpler terms the circumstances of place, are beginning to be recognized by ordinary people as crucial factors in world affairs today, and it is imperative that geography in its wisest modern sense should be accepted not merely as an academic specialism, but as a necessary part of the habitual background of intelligent thinking."

Not long before his death in 1950, I asked Dr. Bowman to state what he felt to have been his most outstanding achievements as Director of the Society. Among other things, he mentioned "an intensified search for authors whose publications would represent geography in its diversity." Certain enterprises in which he had participated helped him initiate this search. In 1912 Archer M. Huntington made it possible for the Society to conduct a Transcontinental Excursion through the United States, in which forty-three European geographers [1] and ninety Americans took part, Bowman among them. Five years later, after the United States had entered the First World War, the Society placed most of its resources at the disposal of the Government, and its building was used as the headquarters of the Inquiry, a group of experts in geography, history, international relations, and other subjects, assembled by the Department of State to make studies in preparation for the prospective peace conference. Dr. Bowman served as Chief Territorial Specialist on the Inquiry and later in positions of high responsibility and influence at Paris during the negotiations. In these ways he enlarged his circle of friends and acquaintances on both sides of the Atlantic, and this, in turn, was of assistance both to him and to the Society in the search for authors, a search that has been pursued vigorously ever since.

This quest for diversity of authorship has secured a substantial representation of Britons among the contributors to the *Geographical Review* and to the various series of special publications that the Society has issued since 1915. A rough count [2] has shown that approximately 9 per cent. of the *Review's* contributors (some eighty persons) have been British and that they have written at least 160 of the papers appearing in its pages, or about 11 per cent. of the total number of papers. Six articles by Britons have also appeared in symposia published by the Society, and British authors are responsible for two books and a brochure among the special publications.

The majority of the British authors have been university geographers. Professors Alan G. Ogilvie and H. J. Fleure have long been contributing editors to the *Geographical Review*. Professor Ogilvie was a member of the Society's staff in the early 'twenties, at which time he wrote 'Geography of

[1] Four British geographers took part in the excursion, three as representatives of the Royal Geographical Society (Professor G. G. Chisholm and Messrs. Alan G. Ogilvie and Henry O. Beckit) and one (Mr. William H. Myles) upon the invitation of the leader of the party, Professor William Morris Davis.

[2] "Rough" should be emphasized. I make no claim to absolute accuracy in any of the figures pertaining to authors and their contributions. A few British authors may have been inadvertently classed as Americans and a few papers by British authors may have been overlooked. The general picture seems however to be reasonably accurate. The figures relate to natives of Great Britain only. Perhaps half to three quarters as many more Australians, Canadians, New Zealanders, and South Africans of British descent could also be counted.

the central Andes' (1922), one of the special publications. Professor Fleure has maintained a friendly and productive association with the Society for nearly forty years, during which he has contributed many notes and reviews and at least five papers to the *Review*, including "Geographical thought in the changing world" (1944). Scheduled to appear soon is a symposium to be entitled 'Europe: land, life and livelihood,' the fruit of joint planning by Dr. Fleure and its editor, Miss Dorothy Good, of the Society's staff; it may be pointed out that Miss Good, though an American, took her doctor's degree at the London School of Economics. The volume will contain papers by Dr. Fleure himself and by Sir E. John Russell. Professor Griffith Taylor (who was born in London and hence qualifies for mention here, though he is often mistakenly regarded as an Australian) has had fourteen papers in the *Review*, the record for its non-American contributors. Mr. O. M. Miller of the Society's staff ranks second among British-born contributors, with ten papers to his credit, and Professor L. Dudley Stamp third with nine.[1] The Society has also recently published, jointly with the Indiana University Press, a volume by Professor Stamp entitled 'Land for Tomorrow: the underdeveloped world' (1952). The names of other well-known British geographers, picked more or less at random from the *Geographical Review's* roster of authors in chronological order of their first papers, include: B. C. Wallis, D. G. Hogarth, H. R. Mill, Alice Garnett, E. H. G. Dobby, E. G. R. Taylor, W. Gordon East, C. B. Fawcett, Arthur Geddes, O. H. K. Spate, and Frank Debenham.

With a view to diversity, geographical contributions have also been secured from many authorities whose primary professional interests have lain in other fields than geography as such—for example, the meteorologist Sir Napier Shaw, the archaeologists Harold Peake and O. G. S. Crawford, the agricultural economist Sir E. John Russell—and especially from administrators, engineers, agriculturalists, and other scientists at work in British colonies and other regions of special interest to Britain. Most of the British contributions have dealt with different parts of continental Europe, the Mediterranean world, the Middle East, Africa, India, and south-east Asia, and they have represented the British genius for geography in all its richness and variety, from the comprehensive synthetic vision of such men as Fleure, Fawcett and Stamp to the specific concern of the engineer bent upon bringing water to a parched soil or the entomologist seeking to control the ravages of a locust pest.

As is to be expected, few of the British papers have dealt with the United States or parts thereof—probably not more than five or six.[2] Giving American readers, as they do, fresh slants on the observation of homely things, papers of this sort are especially welcome. Eighteen or twenty of the 1450-odd articles in the *Review*—a dozen or so by Britons and the remainder by Americans—relate to the land and people of Great Britain.[3] In most of these,

[1] See J. K. Wright, 'Geography in the making . . .,' p. 294, note 1.

[2] Four by my count—papers by G. M. Miller (1933), R. E. Dickinson (1934), P. R. Crowe (1936), and H. S. Wood (1939); see, however, note on p. 163, above.

[3] Apparently, only three papers on Britain proper were published in the *Bulletin* during the entire period 1852–1915; a description of the Roman Wall in England, a

including four by Professor Stamp, problems in urban and industrial geography, land use, city and town planning, and the like are discussed, although other themes have been developed, as in Krehbiel's "Geographical influences in British elections" (1916), Fleure's "The racial history of the British People" (1918), Darby's "The regional geography of Hardy's Wessex" (1948), and Green's "British bus services" (1951).

Britons on the Council and Staff of the A.G.S.

The strongest bonds between Britain and the American Geographical Society have been forged by Britons who have served as members of the Society's Council and on its staff. One of the founders and early leaders was Archibald Russell, a Scot who had settled in New York in 1836 and between 1851 and 1866 held various responsible offices in the Society, including the Chairmanship of the Council. A statistician, he epitomized the institution's statistical interests during its years of dual allegiance—we have seen that it was a "geographical and statistical" society until 1871. Another Scot, the Reverend Dr. James Constantine Adamson (1797–1877), long a resident of South Africa, superintended the Society's operations as Recording Secretary for about eighteen months in 1857–58, and received a salary for part of this time. A man of phenomenal versatility, he read nine papers before the Society while associated with it, ranging in scope from "Useful observations to be made in travel without instruments" to "The present condition of the sciences constituting natural history." He also delivered an afternoon "course of conversational lectures to ladies belonging to the families of members and others." "Female education" was one of his many hobbies. Henry Clews, who came from England to New York in 1850 at the age of sixteen and made a fortune on Wall Street during and after the Civil War, was treasurer of the Society from 1868 to 1875, the years of its recovery from the brink of bankruptcy.

Between Dr. Adamson's resignation and the year 1902 I have found no evidence that persons of British birth were in the Society's service as salaried employees. Since then there has always been at least one Briton on the staff, and since the early 'twenties Britons have continuously numbered about half a dozen on a staff that has averaged around thirty.

In 1902 Thomas Letts, an elderly Englishman, was appointed Map Curator, to work faithfully for the Society until his retirement in 1915. From 1911 until the autumn of 1914, when he returned to England to offer his services to the government, Dr. David Randall MacIver, a British archaeologist, was Librarian. Shortly before his appointment, the Society's staff had moved into its present building, and he supervised the classification and arrangement of the books in the stackroom according to a scheme chiefly of his own devising that has been maintained down to the present.

When Dr. Bowman became Director in July 1915 he brought one of his students with him as an assistant, a young Englishwoman, Miss Gladys M.

review of a travel diary kept in the time of William and Mary, and an account of the highlands of Scotland; there was also a travelogue of a trip to the Orkneys and Shetlands. None of these was by a British author; Professor Paul Chaix of Switzerland wrote the review and Americans contributed the other three.

Wrigley, who had gone to Yale to take her doctorate under Professors Bowman and Ellsworth Huntington, after studying geology under Professor Fleure at Aberystwyth. In 1920 she was appointed editor of the *Geographical Review*, a position that she held until 1949. These were twenty-nine years of creative editorship of the highest order—in the words of Dr. Bowman, a service that has "profoundly affected the volume and the quality of the flow at the source of the geographical river." Ever on the alert for fresh ideas and unrecorded facts of significance to be presented in her magazine, Miss Wrigley carried on a far-flung editorial correspondence in quest of writers to present them. From her desk hardly a day passed that letters did not go forth to distant places, and they elicited a return influx of manuscripts, photographs and maps. Brief, pithy and stimulating, her letters won for her the respect, the gratitude and the friendship of many a correspondent whom she has never met; and among the warmest of her friends thus made have been some of her British correspondents stationed at remote posts in Africa and in Asia.

Miss Wrigley's labours on the *Review* have impinged upon virtually the whole realm of modern geography. In 1948 the Society secured the services of another British scholar, Mr. Stephen Haden-Guest, as editorial consultant in connection with the publication of books. The work of most of the other Britons on the Society's staff is however, and has been, concerned chiefly with maps and cartography. I have mentioned Mr. O. M. Miller, whose original and inventive investigations have gained wide recognition. After a short interval, Mr. Letts was succeeded as Map Curator in 1917 by Miss Ena L. Yonge, who was born in India of English parents. She has supervised the map collection ever since, and under her enterprising management it has increased from 40,000 to 220,000 items. From 1929 until his sudden death twenty years later, Stanley F. Smith, an Englishman who had gained experience through making maps for the Harmsworth publications and the *Encyclopaedia Britannica*, served as cartographer to the *Geographical Review*. The artistic quality and fine craftsmanship of his maps added distinction to the *Review* and won an independent reputation for their draftsman.

In 1920 Dr. Bowman embarked the Society upon its largest single undertaking in research, the production of a *Map of Hispanic America on the Scale of 1:1,000,000* in 107 sheets. This huge map, which conforms with the specifications for the *International Map of the World, 1:1,000,000* but officially does not belong to that series, was brought to completion twenty-five years later at a cost of more than half a million dollars. In a letter written in 1949, Dr. Bowman explained that his own field studies in South America had convinced him of the urgent need for such a map. By producing certain sheets on the pattern of the *International Map* during the First World War, the Royal Geographical Society had demonstrated that an undertaking of this sort might be feasible for another society with comparable aims and resources. Bowman secured assistance from Britain for the enterprise. Alan Grant Ogilvie, one of the ablest of the younger British geographers at the time, was put in charge in October 1920 and for three years saw the map through its early critical stages of experimentation and organization. Since his return to Scotland in 1923 to accept an appointment as lecturer at the University of Edinburgh, the making of the "Millionth Map" and later cartographic

projects to which it has given rise have been supervised by Americans, Raye R. Platt and Charles B. Hitchcock. Much of the work has however been done by four men whom the Society brought over from Britain expressly for the purpose, since cartographers of the requisite training and experience could not be found in the United States; John Forsyth and Norman MacCleod (died 1925) from Scotland in 1922 and 1923, and in 1927 another Scot, John Philip, and the Englishman, Stanley F. Smith (who as we have seen was transferred to the *Geographical Review*). Messrs. Forsyth and Philip are still at work for the Society.

It would be futile to attempt to distinguish the elements of British origin that these people have introduced into the publications of the Society and thus into the larger flow of "the geographical river." They have each brought a rich fund of knowledge and skill, and also special attitudes derived from their British backgrounds. Naturally, during long years in New York they have adapted themselves to the American environment and to the needs of an American institution. But if they have acquired American characteristics from their American associates and friends on the staff, so also have the latter derived British benefits from them. The work of the American Geographical Society has thus meant the merging into a predominantly American stream of a minor but rich and salutary British current, and the two are blended together too completely and too harmoniously to admit of analysis and separate recognition.

For the second time in its history the Society, on 1 June 1950, placed the principal responsibility for the management of its work in the hands of a Briton. In announcing the choice of a new Director, Dr. Richard U. Light, the President, wrote as follows: "... a great and long-enduring responsibility was involved. The appointment therefore was not made hastily, nor was the field of choice limited to the members of this institution or to the geographers of this nation. The net was flung wide. Out of it came a promising young British scientist now only five years established in his Canadian post."

Under the enterprising leadership of this "young scientist," Dr. George H. T. Kimble, the Society is now entering its second century. In his first annual report Dr. Kimble wrote as follows: "Resilience to changing intellectual values and sensitivity to changing scientific needs have long been two of the Society's most distinctive characteristics: we are determined to guard this inheritance and ever to continue the search for new fields of useful endeavour, wherever that search may lead." Let it lead, among other things, to a further strengthening of the bonds with Britain!

SOVIET PLANS FOR IRRIGATION AND POWER: A GEOGRAPHICAL ASSESSMENT

ACADEMICIAN A. A. GRIGORYEV

THE REMODELLING OF nature, and the great construction works connected with it that were undertaken to increase progressively the productivity of Soviet agriculture, are some of the most important of the measures by means of which the Soviet Government seeks steadily to raise the material and cultural level of the people. Works of this kind have been in progress for a number of years over large areas of the country, particularly important being the great construction works in the arid south of the U.S.S.R.—in the forest-steppe, steppe, semi-desert and desert regions. The chief task here is, of course, to eliminate once and for all the pernicious influence of drought.

Even before the Second World War many separate irrigation systems had been built in the Lower Volga districts, in the more arid regions at the foothills of the Caucasus, in the Central Asian Republics, Kazakhstan, the Trans-Caucasian Republics, in the southern part of West Siberia and in a number of other areas. One of the largest constructions of this type was the Katta Kurgan reservoir in Uzbekistan with a holding capacity of 600 million cubic metres and the 350-kilometre Great Fergana Canal named after J. V. Stalin.

At the same time a system of integrated agro-technical and reclamation measures began to be employed in the forest-steppe and steppe areas to combat drought. This problem had just begun to attract attention at the close of the nineteenth century. Such outstanding Russian investigators as the great geographer and soil scientist V. V. Dokuchayev, the plant physiologist K. A. Timiryazev, the soil scientists A. A. Izmailsky, P. A. Kostichev and W. R. Williams, the geographer and silviculturist G. N. Visotsky, and the agro-biologist T. D. Lysenko, worked perseveringly in these fields.

Already in the nineteenth century, Dokuchayev had proved that the water regimen of the steppe and forest-steppe soils deteriorates gradually as a result of irrational methods of farming; and, with Timiryazev and Izmailsky, he elaborated methods for preventing the further deterioration of the water regimen of the soil. These measures consisted in retaining rain and snow water, ensuring snow retention, initiating a system of ponds and reservoirs surrounded by trees and shrubs, planting shelter-belts in the steppe, completely afforesting huge stretches of sand and other non-arable areas, and utilizing artesian waters for irrigation. Kostichev, too, had elaborated the basic principles of the *travopolye* system [1] as a means of ensuring a crumb structure of the soil, and proved the great agronomic significance of this system as a means of retaining moisture. W. R. Williams elaborated a consistent system of measures to ensure the steady rise of soil fertility which

[1] The practice of *travopolye* ("alternate husbandry" or "ley farming") as taught by W. R. Williams, who was himself a Russian, are discussed in his book 'Principles of agriculture' (translated by G. V. Jacks, London, Hutchinson, 1948).

included shelter-belt afforestation, the introduction of ley crop rotations, the building of ponds and reservoirs, irrigation, the correct application of manures, sowing with superior seeds and the careful selection of varieties adapted to local conditions.

Finally, for more than forty years, G. N. Visotsky studied the conditions for planting forests in the steppe, and T. D. Lysenko worked out a new method of growing oak and other tree cultures in the steppe by sowing seeds in "hills," that is, by sowing thirty to thirty-five seeds in one spot. This prevents the germinating tree cultures from being overgrown by steppe vegetation.

The large scale on which these measures were applied, even before 1939, can be seen from the following figures. During the decade of 1931–41 (the period following the All-Union Conference to Combat Drought which considerably speeded up all this work) forests were planted over an area of about 850,000 hectares including 452,000 hectares of windbreaks. This was done by the collective farms of the steppe districts in the south of the European part of the U.S.S.R. (Ukrainia, the lower Don, the middle and lower Volga, North Caucasus), in north Kazakhstan and in the southern part of Siberia. In the Ukraine alone, shelter-belt plantations occupied an area of 259,000 hectares by the beginning of 1941.

Experiments in steppe afforestation in the nineteenth century, and more particularly in Soviet times, have shown that, where the climate is not so severe or cold as it is for example in west Siberia, the best deciduous species is the common oak, because of its longevity, tall stem and sufficiently broad crown. The powerful root system of this tree penetrates deep into the ground and supplies the plant with water and mineral nutrition from the lower strata of the soil which usually contain plenty of moisture and the minerals required by the plant. The leaves of the oak are moreover notably drought-resistant. Other species too, fairly common in the U.S.S.R., can be used for shelter-belt afforestation. Foremost among them are the Siberian larch (*Larix sibirica*), the birch (*Betula verrucosa*), the common pine (*Pinus silvestris*), the gleditschia (*Gleditschia triacantha*), the false acacia (*Robinia pseudoacacia*), the Russian elm (*Ulmus laevis*), ash, poplar and other trees. The choice of tree cultures depends, of course, upon local climatic, soil and hydrological conditions.

Soviet specialists were confronted not only with the task of testing in practice the agronomic methods of combating drought, but also with the no less difficult problem of building hydro-electric stations. The latter constitute one of the most important links in the entire process of developing Soviet economy in arid regions, because the powerful irrigation systems must have big reservoirs that are created by building dams in the rivers. Water must usually be raised from the reservoirs to irrigate areas lying above their level. This is done by pumping stations dependent upon cheap hydro-electric energy.

These hydro-electric stations often have to be built on loose, friable ground which contracts considerably, and is easily displaced and washed away. The difficult problem of building big dams on such ground was first solved during the construction of a Soviet hydro-electric station in one of the northern districts in the late 'twenties and the early 'thirties. New methods were then

evolved which have fully stood the test and have since been applied in building other Soviet hydro-electric stations.

To complete these construction works within the extremely short period of time allotted to the plan, still another condition was required; powerful mechanical devices, to cope with the huge excavation work involved, and turbines of unprecedented power had to be created. Today Soviet plants are producing powerful walking excavators, suction dredges, dump-trucks and concrete mixers that save the labour of thousands of workers and facilitate the fulfilment of the tremendous excavation work involved in an unprecedentedly short time. In these and other ways, all the necessary conditions had, by the end of the 'forties, been created for the realization of the great plan of remodelling nature.

The Stalin plan

Such is the brief outline of the work which preceded the Stalin plan for remodelling nature in the arid districts of the U.S.S.R. and for the building of huge hydro-electric stations and irrigation systems; a plan which grew out of the series of decisions adopted by the Soviet Government from 1948 onwards. The plan is based on the outstanding successes attained by Soviet science and technology, on the constantly growing practical experience of construction, on the conclusions drawn from the results achieved by Russian scientists before the Revolution, and on the further and creative development of their ideas in Soviet times.

The War was a serious set-back to the measures which had already been taken to alter the nature of the arid zones. For instance, the shelter-belt plantations in the south of the European part of the Soviet Union suffered greatly from the German invasion. The post-war measures of the Soviet Government have helped quickly to heal the serious injuries inflicted upon the agriculture and the energy supply base of the Soviet south.

The Stalin plan of transforming the arid regions of the U.S.S.R., and of building great hydro-power projects on the rivers that flow through these districts, covers the south of the European part of the U.S.S.R. from the Ukraine and north Crimea to the districts at the foothills of the Caucasus, the middle and lower Volga, and the Caspian lowlands. In the Asian part of the Soviet Union it includes the basin of the Aral Sea and a big section of the Turkmenian S.S.R. The plan is based on the utilization of water power, which involves the radical reconstruction of the lower reaches of the Dnieper, Don, Volga, Amu Darya, Sir Darya and a number of other less important rivers. The enormous water resources of these rivers will be used not only to obtain electric energy but also to irrigate and supply with water the wide expanses through which they flow. The water will be sent to very distant points along large main canals resembling artificial rivers. The biggest of them is the main Turkmenian Canal which will be 1100 kilometres long.

The Volga

The biggest of these rivers, the Volga, discharges into the Caspian Sea about 256 cubic kilometres of water a year. Before long, the Volga will be transformed along its entire course into a seven-terraced cascade formed by the dams of six powerful hydro-electric stations. Three of these are already

working in the upper reaches of the river, while the three lower ones near Gorky, Kuibyshev and Stalingrad are now being built. Powerful hydro-electric stations are also being planned and built on the big tributaries of the Volga such as the Kama, Oka and other rivers. In this way the Volga and the lower reaches of its biggest tributaries will be transformed into a number of huge artificial lakes or reservoirs connected with each other by shipping canal locks. For example, the dam near Kuibyshev will be 5·5 kilometres long and will raise the water to a height of 25 metres. The Kuibyshev reservoir thus formed will occupy an area of 500 square kilometres and will reach in places

Fig. 1. Southern Russia

40 kilometres in width. This reconstruction of the Volga and its biggest tributaries will make it possible to regulate the water discharge, primarily by retaining in the reservoirs the spring floodwater which makes up 60 per cent. of the annual total. The reconstruction of the Volga and other rivers is being effected in such a way as to provide the maximum of electric energy, the greatest amount of water for the irrigation of crop lands, and the best conditions for river traffic during the entire period of navigation.

Statements published by the Soviet Government show that the capacity of the Kuibyshev and the Stalingrad hydro-electric stations, the largest on the Volga, will amount to about 2 million and 1·7 million kilowatts respectively. In years of average water flow the Kuibyshev and the Stalingrad hydro-electric stations will generate 10,000 million kilowatt-hours of energy each;

together, about one-third of the total potential output of electric energy of all the rivers in the Volga basin. The power resources of these rivers, as yet undeveloped, will be made available in a definite consecutive order.

The total capacity of the Kakhovka hydro-electric station on the lower reaches of the Dnieper, the Tsimlyanskaya station on the Don, the stations on the lower reaches of the Amu Darya and on the main Turkmenian Canal, and a number of smaller stations, will amount to about 500,000 kilowatts and their output will be about 3000 million kilowatt-hours of energy a year. Thus, the hydro-electric stations that are being built in the arid districts according to the Stalin plan will annually generate a total of about 22,500 million kilowatt-hours of electric energy. A considerable part of this energy will go to meet the needs of agriculture—for supplying power to pumping stations, for the electrification of agricultural production (motors, tractors, combines and other machinery used in field husbandry and animal breeding) and for running the numerous factories that will process the farm products obtained on the huge new irrigated areas and for other industrial enterprises located there. An enormous amount of power will be transmitted by high-tension lines to industrial centres of the Soviet Union for the needs of a rapidly growing industry; among them the Moscow region, the energy coming from the Volga.

The reconstruction of the Volga will render it navigable by the biggest river vessels. The main irrigation canals fed by the waters of the Volga, Amu Darya and other rivers will be built in such a way as to make them serve also as important waterways for big river vessels. Thus the 600-kilometre-long Stalingrad Canal will connect the lower Volga with the Ural river: the main Turkmenian Canal will serve as an important waterway connecting the lower reaches of the Amu Darya with the Caspian Sea near Krasnovodsk.

The plan for reconstructing the river network of the arid zone includes the completion (in 1952) of the Volga–Don waterway, the building of which was interrupted by the War. This canal crosses the elevated watershed between the Volga and the Don where the two rivers draw near each other. It will be 101 kilometres long and for 56 kilometres it will pass along an artificial bed. It opens into the Volga somewhat below Stalingrad and into the Don near the city of Kalach in the upper part of the Tsimlyanskaya reservoir. It will have locks, pumping stations, wharves and other structures facilitating the free passage of big river vessels from the Volga basin, and particularly from Moscow, to the Don basin and the Azov and Black Seas.

The building of the Volga–Don Canal will ensure the cheaper transportation of bulk cargo. Within the next few years coal and metal will be sent from the Don along this canal to the industrial centres of the Volga region. In the opposite direction—from the Volga to the Don—a huge amount of lumber will be sent, in rafts and on ships, to Donbas, Rostov, the Azov and Black Sea coast and the western part of North Caucausus. Chemicals, oil and other cargoes will also be shipped to the Don, while large amounts of grain will come in to the Volga from the Don and North Caucasus. The lower Don and the Azov districts will receive automobiles, tractors and paper from the Volga, while the industry of the Don region will send its produce along the waterway to the Volga region. New types of vessels, towed by powerful

screw steamers, will ply along the Volga–Don waterway. Diesel-engined motor vessels with cabin accommodations for 500 passengers will be built for the Moscow–Rostov passenger line.

The Volga–Don waterway will also be used to irrigate areas lying to the south of the canal. It will send the Don water along the 140-kilometre-long Yergenin distributary canal that stretches to the south along the Yergenin Heights and will irrigate and supply with water the areas lying between the Yergenin Canal and the Don river.

The Don

For a clear idea of the magnitude of all this work in irrigation and water supply envisaged by the Stalin plan, let us examine some of the basic systems of main and lateral canals. One of these, the system of canals fed mainly by the Don river, will have as its primary source the Tsimlyanskaya reservoir, the holding capacity of which will amount to 12,600 million cubic metres. This reservoir will be impounded by a dam 40 metres high and 13·5 kilometres long and the system also includes smaller reservoirs on the tributaries of the Don, the Manich and Sal rivers. This system consists of the 190-kilometre Don main canal which passes through the districts lying to the south of the Tsimlyanskaya hydro-electric station as far as Proletarskaya village, and of seven lateral distribution canals, including the Yergenin Canal mentioned above. Their total length will be 568 kilometres; 140 pumping stations will be built along the lateral canals to lift the water to irrigated areas that lie considerably above the level of the waterways. The pumps will be supplied by electric energy from the Tsimlyanskaya station. From these canals the water will be sent along the ramified irrigation and water supplying systems to irrigate 750,000 hectares and to supply with water 2 million hectares of land in the Rostov region and in the southern districts of the Stalingrad region. The irrigation and water supply of the area will be effected step by step, beginning in 1952 and to be completed in 1956.

The Dnieper

The system that will have the Dnieper as its primary source will include the South Ukrainian and North Crimean main canals, stretching for a total length of 550 kilometres, and a shorter 50-kilometre canal which will connect the reservoir near the city of Kakhovka in the lower part of the Dnieper (with a capacity of 14,000 million cubic metres) with the South Ukrainian Canal near Askania Nova.

The South Ukrainian Canal will begin near the city of Zaporozhye on the Dnieper above Dnieproges, where it will take in 600 to 650 cubic metres of water per second, and then flow to the Molochnaya river and on toward Askania Nova and the Sivash. From the Sivash, it will cross the Crimean peninsula, as the North Crimean Canal, to Jankoy and so down through the steppe area to Kerch. A number of reservoirs are being built along the line of the South Ukrainian Canal, the largest of which will be that on the Molochnaya river to the north of Melitopol, with a capacity of 6000 million cubic metres.

Large lateral irrigation canals of a total length of 300 kilometres will branch

off from the reservoir on the Molochnaya river, from the Kakhovka reservoir, and from the North Crimean Canal (near Jankoy). These canals and their distributaries will irrigate 1,200,000 hectares of land in the Ukrainian S.S.R. and 300,000 hectares in the northern districts of Crimea. A further 1,700,000 hectares of land in the southern districts of Ukraine and the northern districts of Crimea will also be supplied with water. The building of this system began in 1951 and will be completed in 1957.

The Amu Darya

The irrigation system to be fed from the waters of the Amu Darya will include, first of all, the great Turkmenian Canal which will at the outset

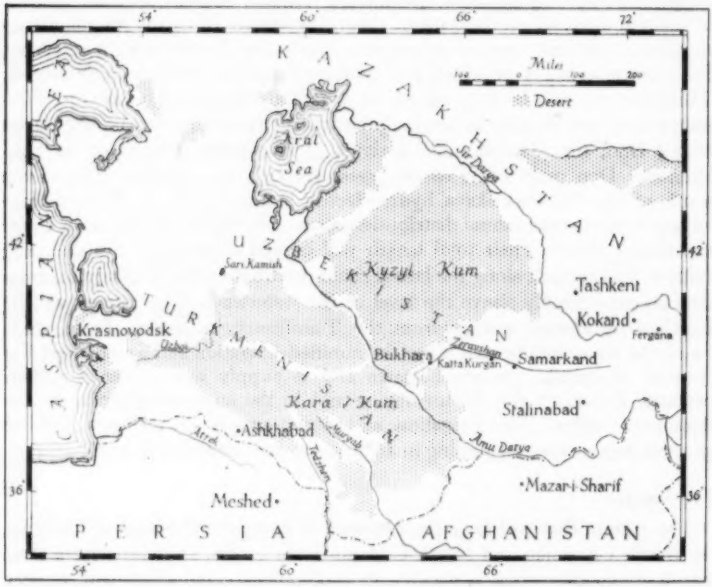


Fig. 2. Western Turkistan

take in 350 to 400 (and later 600) cubic metres of water per second. The main Turkmenian Canal begins in the lower reaches of the Amu Darya and will first pass round the Sari Kamish depression and then through the Kara Kum desert along the ancient bed of the Uzboi. Here it will flow for 500 kilometres in the waterless parts of the Caspian plain in west Turkmenia. Besides the dam on the Amu Darya, in which the canal has its source, there will be two other dams built on the canal itself. Big irrigation canals and distributaries, of a total length of 1200 kilometres, will start from the reservoir on the Amu Darya to water the districts in the lower reaches of that river; others will branch off from the main Turkmenian Canal and bring water to sections of

the Caspian plain in West Turkmenia. This system will irrigate 1,300,000 hectares of new land; 500,000 of which are located in the southern part of the Caspian plain in West Turkmenia and the rest in the lower reaches of the Amu Darya. The main Turkmenian Canal will also bring water to 7 million hectares of pasture land in the Kara Kum desert. Furthermore, big water mains will ensure a sufficient supply of water for drinking and industrial purposes to the enterprises, railways and habitations of West Turkmenia and for planting verdure in these localities. All these works were begun in 1951 and will be completed in 1957.

Crops and irrigation

Based on the Stalingrad hydro-electric station and its huge reservoir, the Stalingrad Main Canal will stretch to the Ural river, and the distributary canals that branch off from it and from the Volga river itself (along its right bank) will irrigate 1,500,000 hectares of land and supply with water another 11 million hectares of pastoral land in the Caspian lowland. Based on the Kuibyshev hydro-electric station, 1 million hectares of land will be irrigated chiefly on the left bank of the Volga, partly by the water of the Volga river but mostly by its tributaries where local reservoirs will be built. Scores of thousands of ponds and other artificial basins that get their water from local streams are being built in the forest steppe districts, in the less arid steppe areas, and in similar districts to the west of the Volga. They will serve to irrigate separate smaller stretches of land amounting altogether to several hundred thousand hectares. The Stalin plan envisages that by 1958 more than 28 million hectares of new land will be irrigated and supplied with water. This constitutes more than 28 per cent. of all the irrigated areas that exist today in all parts of the globe.

The extension of the irrigated areas will make it possible to produce annually an extra 3 million tons of raw cotton, 80 million centners [1] of wheat, 4 million centners of rice, and 6 million tons of sugar beet. Herds of beef cattle on these areas would be increased by 2 million and the flocks of sheep by 9 million heads. In the southern part of West Turkmenia, where the winters are warm, sub-tropical fruits will be grown extensively.

Afforestation

As already mentioned, afforestation occupies a big place in the Stalin plan of remodelling the arid zones. In the forest-steppe and steppe areas it will consist of the following:

(*a*) The planting of a number of broad State shelter-belts, stretching mostly from north to south, in the east of the European part of the U.S.S.R., their total length being 5320 kilometres and their area 118,000 hectares;

(*b*) the planting of forests along ravines and gorges on an area of 1,536,500 hectares;

(*c*) the planting of commercial forests on a total area of 407,000 hectares;

(*d*) the afforestation of sands;

[1] One metric centner equals 100 kilograms and that is probably the measure here referred to.—*Ed. G.J.*

(*e*) the planting of a close network of windbreaks on collective and State farms (primarily around the fields included in the ley crop rotations) on a total area of 5,709,000 hectares.

In the more arid districts, where artificial irrigation will be more extensively developed, broad strips of forest will surround the reservoirs, as well as main, lateral and in general all other big canals, irrigated oases, industrial enterprises and inhabited localities. The inner parts of the oases sown to field crops will be crossed by a close network of narrower tree plantations.

The total area of the planned afforestation in the arid zone, including that of the arid districts of the Azerbaijan and Georgian Republics, will amount to 10 million hectares and, according to plan, this tremendous task is to be completed in 1965. The work is conducted by mechanized methods which considerably reduce costs. For this purpose a network of special stations equipped with all the necessary machines has been organized and will be further extended.

The oak and the pine, the chief drought-resistant and light-demanding species, are not the only ones used. Under the cover of these trees, shade-demanding cultures, such as the lime and also certain forest shrubs, will be planted. Experience has shown that it is precisely such forest strips that make up the best shelter-belts because they are best able to combat the light-demanding weeds of the steppe. This is so because they cast a good shade and facilitate the accumulation of a sufficient amount of decaying matter in the shape of fallen leaves to cover up the soil. The presence of the leaves also prevents the growth of many steppe plants.

Shelter-belt afforestation is being conducted on a large scale because careful practical tests have shown that it greatly improves both the hydrological regimen of the soil and the microclimatic conditions. Experience gained during the dry years has shown that on unirrigated fields surrounded by windbreaks the crop is considerably greater than on fields that lacked such protection, the methods of farming being exactly the same. The difference amounts to from 20 to 30 per cent. for cereals, 50 to 75 per cent. for vegetables and melons, and from 100 to 300 per cent. for grasses. The quality of the grain is also improved.

The climatic effect of windbreaks

Investigations conducted by the Chief Geophysical Observatory in Leningrad and by other Soviet institutions have shown that the changes in the hydrological regimen of the soil and in the microclimate, which are conducive to a rise in yields on the areas protected by shelter-belts in the steppe and forest-steppe areas of the European part of the U.S.S.R., are due to the reduced outflow of water from the surface of the soil. In this respect, the greatest significance attaches to the reduced outflow of snow water. This is explained by the fact that the forest strips act as windbreaks. If the forest strip is sufficiently penetrable to the winds it acts as a sort of aerodynamic screen which breaks up the great eddies into smaller ones. By thus reducing the velocity of wind, and the turbulent vertical exchange of air in the layer nearest to the soil, the windbreaks ensure the even distribution of snow on the fields which they surround. For this reason the windbreaks in the forest-

steppe and steppe areas are planted in such a way as to provide for a 25 to 30 per cent. penetrability to the wind; for if the wind encounters strips of forest through which it cannot pass it blows around them or passes above them, and this leads to a considerably less even distribution of the snow on the fields. Under the conditions prevailing in the Ukraine, the forest strips ensure at least a 30 per cent. increase in the amount of soil moisture in the upper 1-metre layer of the soil, and the greatest increment of soil moisture is observed in May and June when the vegetation of the arid districts stands in great need of moisture. This is of decisive significance for increasing the yields.

In the forest-steppe and steppe zones where the ratios of heat and moisture are such that the potential evaporation of moisture is somewhat greater than the amount of precipitation, increased soil moisture leads to increased evaporation [1] due to the greater transpiration in the plants. This, too, has a favourable influence on yields. In its turn, the increased humidity of the air due to the additional evaporation augments the amount of precipitation in the summer. The unevenness of the soil surface created by the windbreaks intensifies to a certain extent the turbulent exchange of air on the afforested areas during the warm season of the year, as compared with unprotected fields, and this, too, increases the amount of precipitation during the warm months. As a result, the amount of summer rainfall in the forest-steppe and steppe areas of the European part of the U.S.S.R. may be raised to as much as 10 or 12 per cent. of the annual precipitation. This hypothesis is in accordance with the available data; the increase in precipitation likewise favourably influences the yields.

In the more arid districts, particularly in the semi-deserts and deserts of the temperate zone, the windbreaks can be effective only in the presence of artificial irrigation. The plantations of trees that surround and pass through the irrigated oases in the desert greatly contribute to the creation of a considerably different microclimate from that of the contiguous desert. The researches of the Chief Geophysical Observatory and the Institute of Geography of the Academy of Sciences of the U.S.S.R. have shown that both the absolute and the relative humidity of the air in summer in the big oases is considerably greater, and the temperature of the air lower (due to the increased evaporation), than in the surrounding desert. The average monthly temperature in July is 3° C. lower in the oasis than in the desert. There is a 1° or 2° C. drop in the maximum temperature in July, as compared with the desert, and in September the drop is as much as 3° or 4°. A particularly big drop, as compared with the desert, is observed in the surface temperature of the

[1] In the humid zones, where the annual precipitation is considerably greater than the potential evaporation of moisture from the surface of the earth, the influence of the windbreaks on the hydrological regimen of the soil is somewhat different. According to the German microclimatologist F. Geiger ("Der kunstliche Windschutz als meteorologisches Problem," *Erdkunde*, 1951), the influence of the windbreaks manifests itself under these conditions mainly in the decreased evaporation from the surface of the soil, due to the reduced velocity of the wind and of the turbulent exchange of air in the layer nearest to the soil surface. As a result soil moisture is increased. The increased evaporation, due to the augmentation of soil moisture which is observed in the arid districts, is impossible here for obvious reasons.

soil; in the desert in July the temperature at 1 p.m. reaches 65° C., while on the abundantly irrigated *alfalfa* fields in the oasis it is not higher than 35° C. The cooler air in the oasis (from the greater evaporation of moisture, including transpiration), is firmly retained on the area of the oasis and does not let the dry winds penetrate from the surrounding desert or from the upper layers of the atmosphere.

Conclusion

These microclimatic researches into the role and the nature of the influence exerted by windbreaks on conditions of development of agricultural plants, the results of which have been partly cited above, represent only one aspect of the numerous and manifold scientific investigations that are now being conducted to fulfil the Stalin plan. Specialists in every branch of science and technology have been drawn into the work of solving the numerous urgent problems connected with the construction works, and the best methods of using the huge new areas reclaimed. Among them geographers play a prominent role. The Soviet scientific world considers it a matter of honour for research workers to participate in the fulfilment of the great Stalin plan, the aim of which is to promote the peace and prosperity of the Soviet people. The part played by geographic research in the realization of the plan is obvious from the outline of the principal features given above.

Soviet geographers have taken a very active part in the work of the big integrated expeditions in 1949 and 1950, organized by the Academy of Sciences of the U.S.S.R. to study the areas through which the future State shelter-belts and other forests will pass. Working hand in hand with specialists in other branches of science, and most of all with the silviculturists and land improvers, the geographers of these expeditions have studied the diverse physico-geographic conditions of the territory. They actively participated in the solution of a number of practical problems concerning shelter-belt afforestation, problems concerning the exact distribution of the windbreaks and commercial forests, and plantations for combating erosion in districts where ravines are frequent. This work ensures the successful development of the plantations and the longevity of the forests in the difficult and varied conditions of the arid region.

In connection with the decision of the Soviet Government to undertake these water-power projects and irrigation systems, the Academy of Sciences of the U.S.S.R., the Academy of Sciences of the Ukrainian, Uzbek and Turkmenian Republics, and many other organizations, began in 1950 some extensive integrated researches in the transformation of these areas. Here, too, geographers have been working in close contact with specialists in other branches of science and with building engineers. Among the numerous problems tackled, geographers are mostly concerned with the detailed study of the physical geography of the districts to be irrigated and supplied with water. This is necessary for the correct planning of the irrigation network and, in general, for the planning of the entire system of land reclamation measures. Geographers are also engaged in gathering data relating to the economic geography of the lands that are being irrigated and supplied with water. This will facilitate the practical planning of the develop-

ment of their economy, the rational distribution of the different branches of agriculture on the given areas, the distribution of the industries that process agricultural raw material, and the different branches of mining which will utilize local deposits which (due to the absence of a water supply) were formerly mined very little or not at all. Finally, their work prepares the material necessary for the planning of the new settlements and similar developments.

An important place in these investigations is occupied by the researches conducted at special permanent bases that were organized for the study of the natural processes (and physico-geographic processes among them) with which we are confronted in utilizing the irrigated and watered areas. The results of investigations are immediately communicated to the operative organizations which utilize them in their practical work. In general, the entire process of research both in the field and in the laboratory is organized in such a way as to ensure the closest contact between the scientists and those responsible for the practical application of their recommendations. This close contact with practical workers is continuously stimulating research on new problems, many of which would not otherwise have attracted the attention of scientists. The result has been a constant widening of the subject matter for research.

It was reported in *The Times* of 6 May 1952 that the first twelve miles of the Volga-Don canal, from the river Don to the Karpovka reservoir, had been opened to shipping on May 5.—*Ed. G.J.*

THE COASTLINE OF SCOTLAND

J. A. STEERS

THE COASTLINE of Scotland is long and intricate, and of great beauty and interest. Its nature is closely related not only to the structure [1] and physical features of the country but also to glacial and post-glacial movements of land and sea. The numerous islands off the west coast were in comparatively recent geological times part of the mainland, and their separation has been largely responsible for the intricacy of the Atlantic seaboard.

The west coast of Scotland north of the Clyde may be taken as a unit, whose most characteristic features are its sea lochs or fjords. The last paper on the region which was read to this Society emphasized their tectonic origin,[2] but the author failed to carry with him the support of those who contributed to the discussion. Though there is no doubt that the sea lochs owe their present general form to the glaciers that once flowed down them, this does not preclude the view that in most cases the ice probably followed a former river valley which it widened and perhaps deepened; nor does it eliminate the possibility that some of the sea lochs, or former river valleys, coincided with lines of faulting. Even if a fault and a valley are coincident, the effect of the faults on the present physiography is so indirect that it is probably correct to say that there is no definite relation between them.

The valleys are part of a river system which has now disappeared beneath the ocean. The sea lochs between Cape Wrath and Loch Torridon are orientated south-east and north-west. Those between Loch Carron and Loch Sunart are somewhat more variable, but are often characterized by an east–west trend which is also apparent in Mull. Loch Linnhe and the Firth of Lorne and the sounds and lochs farther south nearly all show a north-east and south-west trend. Ting [3] analysed the charts covering this coast, and drew contours which strongly suggest that the pre-glacial rivers formed part of a system which to the south of Skye flowed mainly in a southerly and westerly direction, whereas to the north of Skye the direction of flow was towards the north (see figure).

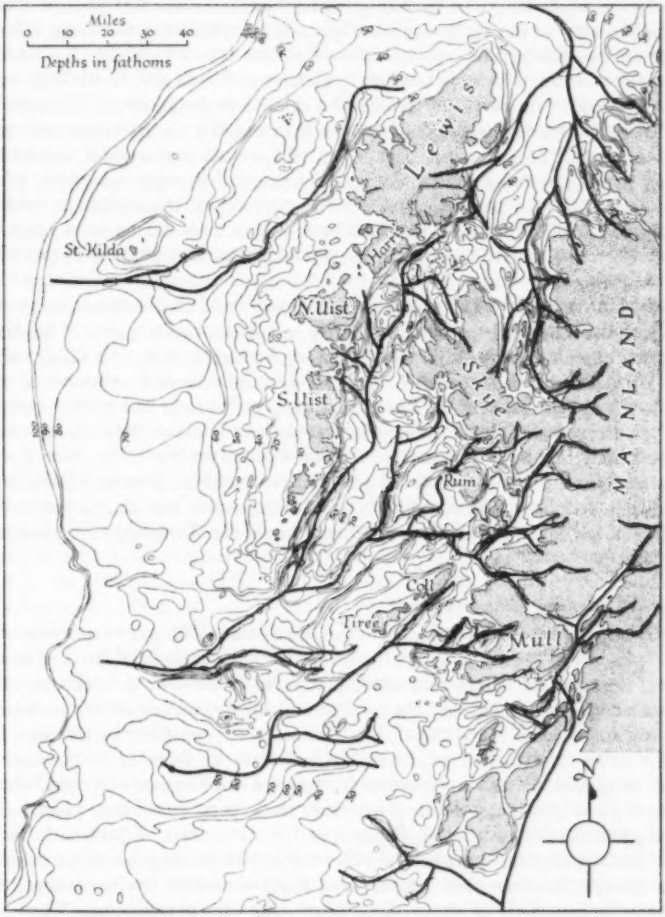
Skye, Canna, Eigg, Muck, Mull and many smaller islands, as well as the western coast of Morven, are formed largely of igneous rocks, and wide areas are built almost wholly of great flows of lava injected with sills and dykes. All these rocks are of early Tertiary age, and were once continuous over what are now wide stretches of open sea. It was upon the surface on which the lavas were later to be poured that the rivers originated. But the piling up of these enormous volumes of basalt, and the growth of the great volcanoes of Skye, Rhum, Ardnamurchan, Mull and Arran, were intimately connected with the

[1] It is not possible to discuss here the relation of the coasts to the geology of Scotland as a whole; the reader should refer to the geological map in a good atlas or the one in the 1 : 625,000 *Planning Series* of Great Britain.

[2] J. W. Gregory, "The fiords of the Hebrides," *Geogr. J.* 69 (1927) 193–216.

[3] S. Ting, "The coastal configuration of western Scotland," *Geografiska Annaler*, 19 (1937) 62–83. See also H. J. Mackinder, 'Britain and the British seas,' 1907.

subsequent collapse of the surface which, submerged, now forms part of the continental shelf. The disintegration is manifest in several ways. The distribution of the basalts and sills cannot be explained unless their present area is extended, and in several places faults are either known or surmised. Judd



The submarine topography of western Scotland (after S. Ting)

marked one along the Sound of Raasay, Sir A. Geikie called attention to another in Morven, and Harker writes of faulting in the region of the Small Isles. The continuation seaward of the Great Glen fault is itself significant. The distribution of the Lewisian Gneiss in Tiree, Coll, the Long Island and the north-west of the mainland, allows the same inference, and the marine

straits—the sounds of Islay, Jura, Mull, Sleat and others—are all parts of drowned valleys modified by ice erosion.

While the collapse of this area may have led to the present configuration of the west coast, many features are still inadequately explained. Along nearly the whole length of the Long Island there is, close to its eastern coast, a marked step in the sea floor; its origin and its relation to the Long Island need investigation. The eastern sides of all the Outer Hebrides are higher than the western sides; this contrast is clearest in North and South Uist, and to a less extent in Barra and Benbecula. Harris is mountainous throughout yet there is a marked difference between the extensive sands on the west and the bare rocky coast on the east. Much of Lewis is plateau-like, but along many parts of the east coast there are prominent cliffs; the west coast, from The Butt almost to Loch Roag, is low and the inconspicuous cliffs lie behind a slightly developed raised beach. The southern part of the west coast is more rugged, although there are often fine expanses of sand as in Camas Uig and elsewhere.

The bathymetrical chart shows that the continental shelf extends far to the west of the Long Island, and St. Kilda represents the remains of another igneous complex comparable with Rhum or Ardnamurchan. St. Kilda, with the Flannans and the Monach Islands, all indicate a former extension of the land. The gneiss ridge of the Long Island appears to have had a steep eastern and gentler western slope, thus giving the primary contrast between east and west which has been emphasized by subsequent events. The island was glaciated from the south-east. The sea lochs, Seaforth, Erisort, Maddy and Boisdale, and the narrow straits between the several islands, all show the effects of ice and their intricate coastlines imply the drowning of a glaciated landscape.

The cliff profiles of the west coast

Raised beaches are prominent on the west coast. The most important are the "pre-glacial" beach at about 120 feet in Islay, Colonsay and the Treshnish Isles; the 100-foot beach, best developed north of the central Lowlands; the so-called 50-foot beach, and the 25-foot and lower beaches which are found around many parts of the coast. The 25-foot beach can often be followed for many miles; the main road from Machrihanish to West Loch Tarbert is built on it, and it is also conspicuous in Ayrshire and Wigtownshire, and along several parts of the east coast. Sometimes these beaches are true pebble and sand spreads; the wonderful displays on the west coast of Jura and North Islay consist of great spreads of pebbles and boulders, staged in three or even four levels. On these same islands, and along almost all the west coast, the platforms, especially of the 25-foot beach, are also conspicuous. They are nearly always backed by lines of cliff in which caves are cut, and the beach platform with its stacks, being often enough the only reasonably level ground, is settled and cultivated.

Anyone who knows the west coast will be familiar with the presence of the raised beach platform even in sheltered inlets. It is conspicuous along the upper part of the Sound of Jura, between Luing and Shuna and inside Seil island, and occurs even in the narrow Cuan Sound between Luing and Seil

and inside Torsa island. Similar examples can be found in Loch Linnhe, the Firth of Lorne and elsewhere. To-day the platform, whether in open or sheltered waters, seems scarcely to be affected by wave action. In the past, wave attack must have been far more severe to have cut wide shelves in hard rocks in sheltered waters. The western side of Rhum faces the open ocean, but along much of its coast the old granite cliffs, behind a beach platform, are untouched and covered with scree. The basalt cliffs of western Skye are steep, often perpendicular, but the amount of erosion now in progress from the direct attack of the sea appears to be small; the precipices of Waterstein Head must be considered in relation to the minor bluffing on the lower ground on which the lighthouse stands.

In the basalt areas of Mull and Skye, cliff forms appear therefore to be largely due to the break up of the area. Seaward slopes have been modified locally, especially during the more severe weather of parts of the Ice Age, yet in many places they seem to be scarcely touched, as in the Sound of Raasay, in Inner Sound (between Raasay and the Applecross peninsula), and in the Sounds of Sleat and Mull. The raised platforms and associated cliffs of more exposed shores clearly imply one or more periods of marine erosion, but there is little to suggest active cutting today. The question then arises—how far are the cliffs simple erosion forms? Those near Cellar Head on the east side of Lewis may be, but along many other parts of the volcanic area we seem to be dealing with original steep slopes of sub-aerial or even fault origin, modified by erosion during the formation of the various raised beaches, but nevertheless not cut far back from the original slopes.

In Sutherland and Islay there is a striking difference between coasts formed of Lewisian Gneiss and those made of Torridon Sandstone. The latter, a well-bedded sedimentary rock, is often cut back to form fine cliffs and stacks, the shape of the cliffs depending largely on the nature of the bedding, the inclination of the dip, and on recent movements of sea-level. The contrast between the west and east sides of Handa Island, the cliffs around the small peninsulas of Rhu Stoer, Rhu Coigach, Greenstone Point, Rudh Re, and between Gairloch and Loch Kishorn illustrate this. They, like the Torridonian cliffs north of Applecross, may be fronted by a raised platform but their profile depends on comparatively simple factors. All stand in contrast to those parts of the north-west coast formed of Lewisian Gneiss. Sometimes, as at Cape Wrath, this rock does form precipitous cliffs, but often the coast consists of an infinity of rounded masses of whitish-grey rock, all heavily glaciated, smoothed, and bare. Their hummocky appearance is striking and, although steep slopes may run down to the sea, they seldom form abrupt cliffs of marine erosion. The sea lochs and numerous offshore rocks and islets all imply a drowned landscape—and, in the north-west, Enard Bay, Badcall Bay, Edrachillis Bay and the coast between Loch Laxford and Kinlochbervie emphasize submergence more effectively than subsequent raised beach features attest a lesser emergence.

On the west coast as a whole the approximately north-east and south-west folding of the Moinian and Dalradian rocks has greatly affected the coastal outline; especially in Argyll and the islands of Islay and Jura, and in the Kintyre peninsula. The marked parallelism of the island ridges and the

numerous sea lochs, especially in Knapdale and around Loch Fyne and Loch Awe, is emphatic. Farther north the gneissic ridge of Tiree and Coll indicates a similar trend, but north and west of the Firth of Lorne the extensive development of igneous rocks and the later founderings obscure the trend lines of those on which they rest. In Sleat and the North-west Highlands the same general trend is repeated, although it has swung round to the north-north-east. The long line of the Outer Hebrides also conforms.

The northern coasts

Along the north coast of Sutherland, from Cape Wrath to near the Caithness boundary, the coast is largely of pre-Cambrian and Moinian rocks. West of Whiten Head the Durness Limestone, which is of Cambrian age, outcrops near the village of that name and in it Smoo gully and cave are cut; it forms most of the eastern shore of the Kyle of Durness and is in contrast with the surrounding Lewisian and Torridonian rocks. Loch Eriboll is in Cambrian rocks (Serpulite grit and quartzite), and its long axis, like that of the Kyle of Durness, the Kyle of Tongue, and smaller inlets on this coast, runs with the grain of the rocks. In fact the detail of the north coast of Sutherland reflects very closely the trend and varying hardness of the many rock groups which reach it.

The same is true of the coast of Banffshire, where the cliff section has been fully analysed by Read,[1] All the rocks (they are Dalradian) are highly metamorphosed. Originally sands, clays, limestones and the like, they are now seen as slates, phyllites, schists, gneisses, quartzites and marbles. All are much folded, sometimes closely, and the dips are often high, the strike being approximately east-north-east and west-south-west. The coast section therefore cuts across the whole series and reveals the effects of folding, faulting and differential erosion. The harder rocks project somewhat, but this effect is obscured in several places by the raised beach platforms in front of the cliffs. The whole series forms a wild stretch of coast and many of the rock groups give craggy outlines. The cliffs vary somewhat in height but as a rule reach about 200 feet. In Banff the rocks present a close parallel with those of the coast of mid-Argyll. The strike is similar and both series are folded, but the higher west with its lofty mountains, long sea lochs, and off-lying islands, forms a marked contrast to the plateau-like nature of Buchan.

The Old Red Sandstone gives rise to a beautiful and characteristic coast scenery. The nature of the beds varies from flagstones and thick bedded sandstones to coarse conglomerates; local changes of dip, and the simple relation of dip and strike to the coast, account for much variety. In Caithness, near Brims Ness or at Hobbie Geo, the thin beds and seaward dip give a profile to which the description "cliff" is hardly appropriate. Near Duncansby the thin flagstones are horizontal and well jointed, and the cliffs are magnificent—high and vertical; the off-lying stacks are the finest beside the mainland of Britain. The more massive bedding and coarser rock at Holborn Head, Dunnett Head and Ulbster also afford precipitous cliffs with many stacks. West of Holborn Head the cliffs are particularly steep.

The Orkney Islands are almost entirely of Old Red Sandstone, and on all

[1] "The geology of the country around Banff, Huntly and Turriff," *Mem. Geol. Surv.* (*Scotland*), 1923.

exposed coasts there are fine features. The Gloup on East Mainland is a great blowhole, more spectacular even than Wife Geo in Caithness; the finest cliffs of all are those on the west coast of Hoy. The perpendicular precipices of St. John's Head, the Old Man of Hoy, and the low ground at Rack Wick which divides the western coast into two main parts are superb examples of coastal scenery. No less interesting are the caves, cliffs, stacks, geos and bays of Western Mainland, especially near Yescanaby, Skaill Bay (the interest of which is enhanced by the remarkable remains at Skara Brae), Marwick Head, and the Brough of Birsay. Old Red Sandstone also forms the coast between Stonehaven and Dundee and contemporaneous lavas occur locally. North of Arbroath and between Inverbervie and Dunnottar there are magnificent cliffs in which the effect of bedding and jointing are evident. The small inlets near Dunnottar are typical.

The relatively horizontal beds, their jointing, and the occurrence of small faults or other lines of weakness, have resulted in the formation of numerous long, narrow, steep-sided inlets called "geos." The most spectacular is Wife Geo in Caithness but all are similar, the variation in form depending upon such factors as dip, bedding and jointing, and on the flatness of the country behind the cliff edge. In some examples as at Crawton, about 5 miles south of Stonehaven, there are small waterfalls. The geos are of all sizes from the small but deep clefts near Arbroath, through the medium-sized inlets south of Dunnottar, to the bigger ones in Caithness, and Ham Geo in South Ronaldsay.

The Old Red Sandstone coast near Tarbat Ness, that south of Arbroath, and that near Johnshaven and Gourdon are interesting rather than attractive, and the raised beach platforms in front of them are conspicuous. The fine cliff detail at Strahangles, near Rosehearty in north Aberdeenshire, was commented on by Sir A. Geikie who claimed the stretch between this point and Pennan as "the noblest sea-cliffs in the north of the mainland of Scotland." The situation of Crovie, Pennan and Gardenstown, on narrow platforms at the foot of steep cliffs, is memorable.

The small outcrop of Permian and Triassic rocks between Lossiemouth and Burghead is geologically unique, but in its coastal scenery may almost be regarded as a less resistant part of the Old Red Sandstone. The rock forms low cliffs with caves, stacks, and arches, partly of "raised beach" age.

The Firths of Forth and Clyde

The east coast of the Central Lowlands between St. Andrew's and Dunbar presents several points of interest. For the most part, the cliffs and foreshore platforms are cut in rocks of Carboniferous age—sandstones, shales, coals, limestones and clays, with contemporary lavas and sills—which give a peculiar character to many parts of the area. The cliffs are low, and more often than not are now out of reach of the sea, a raised beach platform intervening to form a characteristic element in the scenery. Since the beds in which the cliffs have been cut are variable in nature, of no great individual thickness, and locally folded or faulted, the surface of the platform as seen from above is like a geological model. Domes, basins, anticlines, synclines and faults are all seen in plan and, although they are partially or wholly washed over by the sea at high water, owe their appearance mainly to erosion in the raised beach episodes.

Here there is another significant element in the coastal scenery—the numerous pipes, necks and vents of old volcanoes, of all sizes from a few yards to half a mile or more across. Since they occur on the beach platform and in the cliffs, the waves have exposed them both in plan and in section. Since, too, they are composed of rocks either harder or softer than those through which they cut, and also because the shape of the igneous masses is irregular, they produce a distinct variety of scenery. The basalts are often columnar and arranged in great flows; columns are conspicuous at Kincraig, and the Isle of May is formed of an inclined sill which shows good prismatic structure. The vents are filled with blocks of all shapes and sizes embedded in ashes and fine material—the debris which fell back into the craters and subsequently solidified. The outer cones have disappeared, leaving these traces of former activity. The material is black, dark green, or brown in colour and weathers into shapeless masses and lumps. Sometimes, as at Tantallon castle, it forms steep cliffs and, with local variations of hardness, dykes may stand out as buttresses or be worn away into caves or recesses. More striking forms are seen in the Rock (distaff) and Spindle vent near St. Andrew's. Here the main spine is the plug in an old vent and the face, with columns arranged like the spokes of a wheel, was formed by an injection of lava into a circular orifice; cooling at right angles to the outer surface produced the radial pattern of the spokes.

Other interesting examples of igneous stacks occur at the Leithes, near North Berwick, and at Dunbar where the castle is built on part of one. Off-shore, the Bass Rock is an old plug and, but a little distance inland, North Berwick Law and Traprain Law on the south side, and Largo Law with Kellie Law and Carnbee Law on the north side, indicate an earlier stage in the erosion of these ancient volcanoes.

The coalfield area presents rocks of similar nature, apart from the vents, and the coast consists for the most part of low cliffs and a shore platform, in which sandy bays are cut. Industrialization has set its mark firmly in this district.

The coast of Renfrew and Ayr shows some of the same features. North of Ardrossan the Old Red Sandstone of the mainland, Great Cumbrae, and southern Bute corresponds with the coast north of the Tay. In these sheltered waters a raised beach is nevertheless strikingly developed. The main coast road through Skelmorlie and Largs follows it closely, and its extraordinary development on all sides of Great Cumbrae is noteworthy.

Between Ardrossan and Girvan the Coal Measures and Old Red Sandstone, together with intrusive and extrusive igneous rocks, make up the coastal area. The coast is low, with broad erosion platforms and extensive sandy bays cut back in the softer rocks. Locally, igneous rocks add interesting detail as at the Heads of Ayr, Greenan Castle, Troon and Maidens.

The Southern Uplands

Intense folding is here apparent in many places, but there can be few better instances than between St. Abb's Head [1] and Fast Castle, a distance of about

[1] Sir A. Geikie, 'The geology of eastern Berwickshire,' *Mem. Geol. Surv.* (*Scotland*), 1863.

3 miles in a direct line. An indication of the nature of the folding is perhaps best given by calling attention to the more prominent features visible in the cliffs; the rocks are Silurian and mainly mudstones and greywackes. The synclinal at Pettico is followed by an arch at Thrummie Carr and a double fold on Biler's Craig skerry. Minor features follow, but at Whitestone Heugh the strata are vertical or overturned. At Little and Great Pits there are some interesting twists in cliffs 500 feet high, the highest in eastern Scotland, and nearer Heathery Carr there are several rapid folds. Close to Shilments, a fracture breaks the sequence and is soon followed by more folds, some of which are seen at Brander Cove, Dulaw, and the Souter. Small scale folding is remarkably clear at Fast Castle itself. The relation of these numerous contortions to the direct incidence of marine erosion has yet to be worked out.

At the other end of the Southern Uplands detailed folding is often visible in the cliffs; for example, more than sixty anticlines and synclines are found in a distance of a mile and a quarter between Corsegard Point and Knockbrex in Kirkcudbrightshire. In this part of Scotland raised beach phenomena play a great role, and the main coast roads sometimes follow them for long distances. The Rhinns peninsula is joined to the mainland by raised beach deposits resting on in-faulted Permian beds.

Frequent allusion has been made to raised beaches and the platforms on which they rest and a study of the coasts of Scotland emphasizes their importance, not only as physical features but also as economic assets. Apart from the roads which so often follow them, they have also been widely cultivated and in many parts of the Highlands afford the most fertile land. Settlement has naturally taken place on them, and many of the inlets cut into them make excellent small harbours. Scenically, they are a most important item in the coastal landscape. Their widespread occurrence means that many lines of cliff owe little, if any, of their form to present day conditions; even the great cliffs near Duncansby in Caithness are fronted by a fragment of raised beach and in embayments in the north coast of that county there are traces of them.

Erosion may be severe locally, but a walk along the Ayrshire coast between Lendalfoot and Ballantrae, around Arran, along the Fifeshire coast between St. Monance and Crail, in many parts of the Firth of Lorne, or even in exposed places like the west of Lewis and the west of Rhum, leaves the strong impression that at the present time the sea is either a far less powerful agent of erosion than it was when the platforms were cut, or that it has been at its present level such a relatively short time that it has not been able to do more than fret the outer edge of the platform.

Sand and shingle formations

Around many parts of Scotland, and frequently in places where recent movement of sea-level has either left a shallow flat or a wide and low platform, there have accumulated great expanses of shingle and sand. The coasts between Fort George and Burghead, from Lossiemouth to Buckie, from Fraserburgh to Peterhead, from Newburgh to Aberdeen, at Buddon Ness and Tents Muir and farther north at Morrich Moor, are some of the best-known examples. The most spectacular spread occurs near Forres, where the great

dunes of the Culbin Sands [1] have accumulated since the latter part of the eighteenth century. What was once a fertile barony is now a desert with dunes a hundred feet high. The Forestry Commission took the area over after the First World War and careful training and planting are now responsible for its gradual reclamation. The dunes here and at Burghead rest largely on shingle ridges which were piled up by the waves during the 25- and 15-foot raised beach episodes. The great masses of shingle near Speymouth, at Hilton of Cadboll and in several other places, are partly of a like nature.

In north-east Aberdeenshire the dunes and beaches form long curves joining low rocky headlands; they have enclosed Loch Strathbeg, and in so doing are said to have caused the decay of the old port of Rattray. At Forvie, at the mouth of the Ythan, the dunes have partly buried agricultural land and former dwellings as at Culbin.

Morrich Moor and Tents Muir are two wide expanses of sandy pasture, also partly dune covered. They are low lying and flat, and were brought into being in the final fall of sea-level from the episode of the 25-foot beach. Shingle is generally absent and the two areas, although interesting, have not the richness of Culbin Foreland. Buddon Ness, a large triangular sandy foreland at the mouth of the Firth of Tay, is in one sense the counterpart of Tents Muir on the south side of the firth.

All round the coast of Scotland numerous examples of river deflections, beaches at bayheads and sand beaches at the foot of cliffs are to be found; there is little that differentiates them from those found along any indented coast, but two features call for special comment—the "machair" of the Western Isles, and the "ayres" and "oyces" of Orkney.

The machair consist of shell sand which is thrown up in enormous quantities on the beaches on the western side of the Outer Hebrides, and also on Tiree and other inner islands. Along the Atlantic coast of the Long Island the sea is shallow and the coast in South Uist, for example, is fringed by wide sandy beaches running between low rocky headlands and backed by a line of dunes. Within the dunes is the true machair, a sandy plain between the sea and the peat and hills. It is fertile, for humus reaches it in various ways: by birds, by the sea casting up masses of seaweed, and by the hand of man who spreads dung on it and carries the seaweed cast up by the waves to the ploughed parts. The westerly gales carry the sand far inland. On a clear and warm summer's day the wide spread of sandy country, interrupted by many lochs, faced by dazzling white beaches and blue sea and covered with innumerable and strongly scented flowers, is at its best. Fine lines of dune often accompany the machair, as on Barra or at Traigh Luskentyre in Harris, but the flat grass- and flower-covered plains, grazed and cultivated by the crofters, show the formation in its most typical development.

In Orkney there are many examples of shingle beaches which either pond back a lagoon or unite islands that were once separate. The beaches are called ayres, the lagoons oyces. Deerness is joined to Mainland, and South Walls to Hoy, by ayres, now strengthened to carry roads. Vasa Loch on the west (and sheltered) side of Shapinsay is enclosed by an ayre which is cuspate

[1] J. A. Steers, "The Culbin Sands and Burghead Bay," *Geogr. J.* 90 (1937) 498–528; this paper also describes The Bar at some length.

Air Ministry, Crown copyright reserved

The Bar near Nairn, with the afforested area of Culbin (Low Wood) on the right

Mesozoic beds underlying lavas, Carsaig Bay, Mull

Steep cliffs in thinly bedded Old Red Sandstone, north of Inga Ness, Orkney

Typical coastal scenery in the Lewisian Gneiss, Tarbet, Sutherland

Courtesy of H.M. Stationery Office, Crown copyright reserved

The Rock and Spindle, a volcanic neck in Calciferous Sandstone, near St. Andrews

Heathery Carr, a mile west of St. Abb's Head, Berwickshire

Phots. Air Ministry, Crown copyright reserved

The coast of Sutherland, looking north-east to Helmsdale; platforms of the 25-foot and 100-foot raised beaches in the foreground

seawards. The boulder clay cliffs to the north and south supply abundant shingle, but it is difficult to see how beach drifting can have produced the present outline. A cursory inspection suggests the possibility that the apex of the ayre is all that remains of a former islet or knob of boulder clay; at the apex a dune 2 or 3 feet high covers boulders up to 2 feet long, which do not appear to have been thrown up by wave action. Just off-shore is a rocky skerry.

The Firth of Clyde and the Galloway rivers

The probable connection of the western sea lochs with former rivers is shown on page 181, but in the Clyde area there are complexities. It is probable that before the granite of Goat Fell was uncovered Arran was still incorporated in the mainland, forming part of the Tertiary plateau then some 2000 to 3000 feet above sea-level. This was trenched by valleys, and the major depression of Glen Chalmadale–North Sannox may be part of one of them. At a later date, and in Tyrell's view as a result of fracturing,[1] the valleys of Kilbrannan Sound and the Firth of Clyde were formed, thus isolating Arran. Not until this had taken place was it possible for the north-east and south-west streams of Lochs Long and Fyne to drain to the North Channel.

A discussion of the origin of the river systems of central and southern Scotland is only relevant here in so far as it throws light on coastal physiography. The older view of a north-west to south-east drainage, from the Argyll highlands to the south-east, and the reversal of flow of the lower Clyde through the Biggar Gap, has given place to a theory far more convincing. Bremner and Linton[2] both suggest a former east–west drainage, and the configuration of Cowal and the Loch Lomond district is highly suggestive of such a system, disrupted by a later north-east and south-west system after the formation of the Firth of Clyde. In the western part of the Southern Uplands, the Nith, the Ken–Dee and the Cree are all in valleys which completely trench the mountains; possibly the rivers associated with these valleys rose far to the north-west at an earlier period, and they may have been connected with the transverse valleys of Arran. They may also have extended farther to the south-east and formed tributaries to a Solway River. The increasing width of the Solway bays may be correlated with a decrease of summit levels in the watershed between the Clyde and the Solway, and possibly the subsidence of the land was greater in the west.

Conclusion

The foundering of the west coast, probably as a result of fracturing, finds no parallel on the east. Scotland and Scandinavia were formerly connected, but their separation and the formation of the North Sea (not necessarily events of the same age) have come about rather by gentle warping and

[1] 'The geology of Arran,' *Mem. Geol. Surv.* (*Scotland*), 1928.

[2] A. Bremner, "The origin of the Scottish river system" (Part 2) *Scot. Geogr. Mag.* 58 (1942) 54–9; D. L. Linton, "The origin of the Tweed drainage system," *Ibid.*, 49 (1933) 162–75, and "On the former connection between the Clyde and the Tweed," *Ibid.*, 50 (1934) 82–92.

subsidence. During the Ice Age, the North Sea basin was more than once occupied largely by ice, and the growth of ice caps, even if they did not fill the basin, must have caused such falls in sea-level that extensive areas of the basin would have been dry. Faulting has not been absent along the east coast. The prolongation of the Great Glen fault carries it along the coast of the Black Isle and the peninsula of Tarbat Ness, and farther to the north-east the coast of Caithness and the eastern edge of the Orkney bank are related to it. A smaller parallel fault also brings down Jurassic rocks on the east coast between Brora and Helmsdale. The submarine contours suggest that a river, to which the existing streams were tributaries, formerly flowed approximately parallel to this coast. A second major stream followed the furrow along the coasts of Moray, Banff and north Aberdeen, and a third trunk river may well have followed the coast between the Tay and Aberdeen. These now submerged channels must be considered together with the buried channels of the Forth and other rivers. The gradual easterly slope of the country is also brought out by the present river courses, and by the preservation of large tracts of Old Red Sandstone around the Moray Firth and Caithness. This formation, and even newer rocks, once spread over wider areas of the interior, and it was on their surface, east of the Tertiary volcanic area, that the present rivers originated.

In the Ice Age, ice spread over almost all the country. Tongues advanced along the main valleys and, in the east, spread over the intervening watersheds at stages of maxima. River erosion preceded and followed erosion by ice, and fluctuations of sea-level in glacial and later periods are sufficient to account for the main inlets. The "sutors" of Cromarty are no exception, despite the contrast they make with other east coast inlets. Hugh Miller long ago suggested that the original entrance to the Firth of Cromarty was cut by the river Conon in the Tertiary period, when Easter Ross was thickly covered by Old Red Sandstone and Mesozoic strata.

Thus the contrast between the two sides of Scotland is the result of (1) original differences of height between east and west; (2) the much longer and gentler slope to the east from the watershed; (3) the occurrence (still more in the past) of extensive areas of Tertiary igneous rocks on the west, and of sedimentary rocks on the east; (4) the formation of long river valleys with gently sloping sides in contrast to the steeper and shorter west coast rivers; (5) the different effects of ice concentrated in narrow valleys on the western side and in the wider, more open, and far less deeply cut ones on the east; (6) the great difference between the collapse of the Tertiary volcanic area of the west and the probable gentler subsidence of the east.

The eastern cliffs are primarily if not wholly normal marine forms, though certainly modified by fluctuations of sea-level, and stand in marked contrast to the steep slopes of the west where marine action has locally had but little effect.

WHAT IS AN ENGLISH GEOGRAPHICAL NAME?

M. AUROUSSEAU

WHAT IS AN English geographical name? The question is one of a kind about which we now find it hard to think clearly. In this instance, the different associations of the word English, and the continual confusion between a name and its spelling, combine to cloud our thought. A name is not merely something written down on paper, but is primarily a *sound* or sequence of sounds in a particular language, by which a particular thing is identified in that language. Its spelling, like the written representation of a vowel or consonant, is a matter of convention, that is, of received habit. An English geographical name is therefore, in the most general terms, the spoken word or words by which any part of the world, or any place in the world, is known in the English language. The written name is a mere record of the sound.

An excellent example of an indisputably English name which has entered into the names of places and of geographical features in many parts of the world is afforded by the name Clarence. One has only to think of Clarence Strait between Qishm and the mainland of Persia (which has no Persian name), or of the Clarence River in New South Wales, to appreciate its importance in the catalogue of English geographical names. But, like many other such names, it is one difficult to explain. It commemorates, as a rule, King William IV when Duke of Clarence. But where is Clarence? There is no place of that name in England except Port Clarence on the Tees. I am told, by the College of Arms, that the title relates to Clare in Suffolk and that there is no foundation whatever for the belief that it refers to a supposed ancient duchy of Chiarenza or Glarentza in the Peloponnese. The derivation from Clare in Suffolk is possibly through a Latin genitive (Clarensis) as Isaac Taylor suggested.

A comprehensive English or American dictionary records the more important names of persons and places in regular use in English, and most of the English words derived from them. A good English dictionary to a foreign language may also do this, but will at least give a supplementary list of proper names used in English. The dictionaries are not consistent either in choice or presentation of the names (even Murray's 'New English Dictionary' deals with the name "Western Ocean" under "Ocean"), but the authorities on our language agree that many places where English is not spoken are known to us in speech or writing, or in both, by names or forms of names which are not identical with the native names.

English, which developed as the language of the people of England—that is, of the English people—is now however the mother-tongue of all people of British descent in Her Majesty's dominions and is the national language of the United States of America. It is the official language of the United Kingdom and is officially used (though not necessarily as a first language) in the new British Empire. It is developing regional characteristics in several parts of the English-speaking world, and we recognize certain words, expressions and habits of speech as American English, Australian English, and so on. Americans do not say the word Paris just as we do. It has, within the English language, both American and English *spoken forms*.

It is important to distinguish, too, between the names of places in England,

and English names of places outside England. The latter fall into three groups: names of places in other parts of the English-speaking world, of places in parts of the world where languages other than English prevail, and of places in, or of parts of, the unclaimed wastes of the world. Classification both by language and by the distribution of the names is necessary.

The names of places in England constitute a very important part of the English language. They are the special concern of toponymists, in particular of the English Place-Name Society, and of all Departments of Government which deal with Home Affairs. They are entered on our official maps by the Ordnance Survey and on our charts by the Admiralty. The spoken forms of many of them, the live words, now differ considerably from those suggested by their accepted spellings. It is customary to refer to them as *English place-names*. They attract many students, both English and foreign.

The names of numerous places in other countries where English is the tongue of all or of a considerable proportion of the people, are of English origin, and to that extent are, strictly speaking, English names. But they, and distortions of many native names of places in those countries, are an important part of the vocabulary of the variety of English now spoken there. It will be convenient to refer to them as *American place-names*, *New Zealand place-names*, and so on. Launceston (Lawn-ston or Lahn-ston) is in Cornwall, but Launceston (Lawn-cess-ton) is in Tasmania.

Countries where languages other than English are spoken are of two kinds: those where English is, or until recently was, the official language but is exceeded in importance by native languages; and those where English is not spoken.

The unclaimed wastes of the world consist now of the oceans and seas, and of a sector of the Antarctic continent. English names for most parts of the waste of waters became fixed in the language step by step as English knowledge of the world expanded. English names given to places in the unclaimed parts of the Antarctic continent have hardly yet found a way into our common speech, but have a proper place in the written language.

The "correct" name of a place at a given time is, for most purposes, the received form in the language which then prevails there. (If more than one language be spoken there the place will have more than one "correct" name.) The speakers of another language will, in most instances, distort the name in their efforts to say it, whereby a number of foreign spoken forms will be produced. Most English attempts to pronounce foreign names produce English spoken forms. Berlin, as pronounced by Germans, sounds somewhat like "bear lean." By no means all our knowledge of the names of places in foreign countries has been acquired, even vicariously, by ear. Some of our established spoken forms result from attempts to read out, mainly from atlases, the written forms of foreign names which we rarely hear. With little or no knowledge of the languages concerned, we have done no better than to say the words in the English way. The Elizabethan pronunciation of "kelliss" for Calais was probably so established. Our manner of saying Paris, which must be very old and differs radically from the French, possibly also settled in this way.

The English spoken forms of the names of places taken into English from other languages may differ markedly from the native forms, but our written forms of a great many which are officially written in varieties of the Roman alphabet abroad are, fortunately, the same or nearly so. There is little need for us to alter the spelling of the official names of places in western Europe or the Americas. English, however, is written without diacritical marks, and we fail accordingly to respect those of other languages when we write foreign geographical names in English context. We commonly write "the Rhone," though

we may be careful to write "Rhône" in French. Strictly speaking, we have established numerous *English written forms*, as well as a very large number of spoken forms, of western European, African, American and Oceanic names. Nobody writes Panamá or Pará in English.

For names brought into English from languages normally written in alphabets or scripts other than the Roman, that is, in characters which have to be transliterated or transcribed before they become intelligible to us, we establish English written forms in immense numbers. "Moscow" spells the spoken English name of the capital of Russia; "Moskva" is an English rendering of the Russian written form. The names of most places in Russia and Asia are known to the English public only in English written form. It is a mistake to suppose, as some do, that we are using Russian or Persian names. Our written forms are English renderings, from which we are increasing our stock of spoken forms.

Many places in parts of the world where English is not spoken by the native peoples are known to us however not by English distortions, oral or graphic, of the present native forms, but by names which are clearly not English; but neither are they used at the places to which we apply them. We call the capital of Denmark "Copenhagen" but the Danes call it København. The Danish name is difficult for us to pronounce and to print, but its German form, "Copenhagen," we can imitate easily though (in speech) imperfectly, for we make it rhyme with "pagan" instead of with "bargain." Such a name, taken into English from a source foreign to the place concerned, or from a former state of the language spoken there, is a *conventionally English*, or a *conventional* name. It is, so to speak, an indirect loan-word. Conventional names are widely used in spheres of special interest. The Churches and Colleges apply them to many places in the Old World (*e.g.* Joppa, the Paropamisus chain). The iron-ore trade has its own conventional names for some places (*e.g.* Bona for Bône) and for certain ores (*e.g.* Seriphos Mavra). The timber trade provides an example in the name "spruce," which comes from the Polish expression "z Prus," meaning "from Prussia."

To distinguish them from "English place-names," the several kinds of English names of places and of parts of the world outside England might conveniently be called *English geographical names*. Many English words are derived from them. With this distinction made, it becomes clear, by analogy, that there are French geographical names in Canada, and that they are also part of the sum of Canadian place-names; that there is a legitimate study of Scottish place-names, but that "Scottish geographical names" do not exist. Gaelic geographical names, on the contrary, belong to reality, and those of places in Scotland form a large part of the sum of Scottish place-names.

English geographical names, as a whole, are of importance to all authorities and organizations in the United Kingdom and certain other parts of the English-speaking world which are generally concerned with External Affairs, but they are not the particular concern of any one authority. A corresponding statement might be made about "American-English geographical names," since American speech is now developing its own forms of foreign names [1] and Americans prefer to derive them from the foreign official sources rather than from the established stock of English and conventionally English names. But we are here considering the subject mainly as it appears to people in England. Our names of the oceans and seas, and of international waters and water-ways, are entered on our charts by the Admiralty. English names of places in English-speaking countries, and in British Colonies, are entered on official maps by

[1] See 'World words,' by A. Cabell Greet, 2nd ed., New York, 1948.

those countries and colonies. But English names of places in countries where English is not spoken are disregarded there, except in English context. Those, too, of many places in parts of the Commonwealth where English no longer prevails over native languages may fall out of use there. Part of our old, almost traditional vocabulary of English geographical names is, in fact, already going out of use, because the last fifty years have increased our need for more exact knowledge of the "correct" native forms. The British Benares, Cawnpore and Lucknow are already Banaras, Kanpur and Lakhnu when written in Roman letters in India.

The names of places in foreign territorial waters interest the Admiralty; those in foreign countries interest the War Office, Foreign Office, Ministry of Transport, Post Office, etc.; those in the new Dominions interest the Commonwealth Relations Office; and for correct rendering of those in the Colonies, the Colonial Office is ultimately responsible. Certain Departments of Government are now anxious to establish the best possible written forms of the names of places overseas on British maps and charts, public instruction on their pronunciation being left, as yet, to such authorities as the British Broadcasting Corporation. Chisholm's "Notes on the spelling of some common geographical names," published over half a century ago,[1] shows that the problem was then handled by the geographers, who regarded it simply as one of spelling. Rational and regular ways of recording unwritten names, and of improving the spelling of established English geographical names and forms of names, were sought. Tokio became Tokyo. This problem is now regarded as one for official solution. The important languages have nearly all been reduced to writing and means of securing the proper identification of places in countries where English does not prevail are being provided, through the precise English rendering (not necessarily phonetic) of the official, written forms of their names. Written forms long familiar in English use are passing out of the language, but a new and ampler vocabulary based on more scientifically written forms is quietly coming into existence. It is certain, nevertheless, that our well-tried names of the oceans and continents, of the seas, countries and regions, of the capital cities, great sea-ports and international water-ways, of the mountain ranges, greater lakes and great rivers, and of all those features and places which have become symbols in the English imagination, will continue to live in our daily speech.

In June 1939 the Siamese Government announced by official decree that the name of Siam would thenceforth be Thailand "in the English language." Sir John Squire has protested against this curious announcement.[2] On the second occasion he wrote: "When that change was made I asked a Siamese why on earth they had done it. His reply was that they thought the change would please Europe, and particularly England. I said: "Look here, my dear fellow, all Europe since Elizabeth's day has known your country as 'Siam'; . . ." Unfortunately British authorities acquiesced in the change, and the bastard name Thailand has gained international currency as a postal name. But that we should renounce our living name "Siam" in favour of one which the Siamese themselves do not use (they call their country Prathet Thai or Muang Thai), is, I hope, unlikely while English is a living tongue. It was no more appropriate for the Siamese to decide what their country is to be called in our language than it would be for us to decide what anything is to be called in Siamese.

If English geographical names as a whole are not the concern of any one authority, neither have they attracted many students. R. S. Charnock (active 1859–94) and Isaac Taylor (1829–1901) merely glanced at them. Some names

[1] *J. School Geogr.* 3 (1899) 161–67.

[2] See *Illustrated London News*, 198 (1941), p. 372, and 202 (1943), p. 548.

will be included in the place-name studies now proceeding in English-speaking countries overseas, where they can hardly be appreciated with regard to the English of England. M. J. C. Meiklejohn's book 'The place-names of the English People at home and overseas' (London, 1929) is a slight work and essentially a place-name study. English has suffered no more neglect in this respect than other languages. I know of only one German paper which deals directly with German names of places abroad.[1] There is a paper by C. A. Nallino[2] on Arabic names and a small work which I have not seen by A. J. Schreuder[3] on Dutch names. Portuguese names on the west coast of Africa have recently been collected by A. Texeira da Mota,[4] and small lists exist of Chinese and Japanese names of places outside China and Japan.

In the meagre literature of English geographical names, an anonymous paper on "Names of countries used in other countries"[5] is important, and several studies by the Swedish toponymist, Gösta Langenfelt, are exemplary. In his 'Toponymics or derivations from local names in English' (Uppsala, 1920) he has assembled a great amount of information about words derived from English geographical names which will help in the recognition of these names; he has detected what seems to be an error in the interpretation of the Shakespearean word "Dansker" which refers to Danzig, not to Denmark;[6] and his paper "Sweden: a monograph on the name of a country"[7] must rank as one of the most thorough studies of its kind.

If we are to know and understand our English geographical names, much more work like that of Langenfelt should be done. It is because we do not properly know them, or know how to use them, that this discussion is necessary. Many people consider that English names for foreign places should now be ruled out of use. But this is to misunderstand the nature of language and the function of writing. No legitimate part of our spoken language should be ruled out of use, for it is what we use instinctively. We can pronounce few foreign names in the foreign way in the course of English speech. Neither can we write the majority of them phonetically in the English alphabet. "It is very difficult to render the principal sounds of one language by letters of another," wrote W. Eton over a hundred and fifty years ago.[8] The spoken language needs its forms of foreign names, which we should continue to spell in the accepted ways. But we should keep them for use amongst ourselves, for their place is in our speech and in literature meant only for the English public. In our technical studies, and on our large-scale maps of other countries, we should ensure the right identification of places by using foreign names or the closest English transliterations or transcriptions of them.

This is really to recommend that British large-scale maps and charts be in the languages of the countries represented. More and more Admiralty charts are in fact being so transformed, and the geographical names in the corresponding volumes of Sailing Directions are being brought into agreement with them. The principle has decided advantages, for it simplifies routine discussion

[1] R. Seager, "Deutsche Namen nichtdeutscher Orte," *Vjhft. geogr. Unterr.* 2 (1903) 156–60.

[2] C. A. Nallino, "Les noms géographiques du monde musulman dans les publications arabes modernes," *Bull. Soc. géogr. Caire*, 7 (1907) 1–17.

[3] A. J. Schreuder, 'Nederlandsche plaatsnamen buiten de landsgrenzen,' Middelburg, 1939.

[4] Centro de Estudos da Guiné portuguesa, No. 14, Bissau, 1950.

[5] *Geogr. J.* 85 (1935) 458–62, and 86 (1935) 179, 558.

[6] *Finsk Tidskrift* (1920) and *Studier i Modern Språkvetenskap* (1949).

[7] *Neuphilol. Mitt.* 33 (1932) 92–121.

[8] 'A Survey of the Turkish Empire,' London, 1799.

between British and foreign hydrographic authorities. It is mere common-sense to address a letter to "Germany" rather than to "Deutschland," for the sake of those who sort the mail here; but the name of the place to which it is directed is better written "München" than "Munich" for the sake of those who must again sort it in Germany.

What we must avoid is the introduction of supposedly phonetic spellings of foreign names into written English, for most of them will be no more than crudely phonetic at the best, and they may lead to wrong identifications when compared with the foreign forms. We need therefore to know both our English geographical names and the foreign names to which they correspond.

We should begin by recording our spoken forms in the International Phonetic Alphabet. Part of this work has already been done by Professor Daniel Jones [1] and by the British Broadcasting Corporation [2] We should then collect our written forms from English literature and maps. It would be instructive to begin with our forms of Welsh or Irish names. Those names which prove to be written in the same way in English as in the other languages concerned, will lead to no difficulty, but those which differ may need historical investigation. We shall discover that some English forms are not easily to be detected. I have suggested elsewhere [3] that the forms Geneva and Genoa may be English, but the proof would come only from toponymic research. In our writings on countries such as India and parts of Africa an unexpected number of English and conventional forms may be found, and it will be important to understand them. Accra in the Gold Coast is, for instance, merely the European corruption of the Twi form (ŋkraŋ) of the original Ga name (Gä).[4] The status of some well-known names may be hard to decide. What is Leghorn? [5] The meaning and history of the corresponding Italian name, Livorno, may appropriately be left to Italian toponymists, but the establishment of the form Leghorn in English is for Englishmen to explain. It is work for English toponymists or phoneticians rather than geographers.

The recognition of certain English and conventionally English geographical names is not necessarily a simple matter and herein, perhaps, lies the real difficulty in dealing with them. But their utility is beyond question, for most of them apply to the prominent features of the world. It is not convenient to refer to the Nile, the Danube or the Amazon by any of the native names used in the countries through which they flow. It may be offensive to choose a local name for a feature like Lake Ochrida, which extends into two countries.

Conventionally English names are possibly more important than purely English names, for, coming to us indirectly from other tongues and other times, they have some degree of international currency. Those of classical origin are widely known in the world of Western learning. Many of them are European rather than English names, and some of them are the legacy of Ptolemaic geography bequeathed to us by the sixteenth and seventeenth centuries. There is still a use for names like Oxus, Jaxartes and Araxes.

In the experience of the P.C.G.N.[6] the number of valid English geographical

[1] 'An English Pronouncing Dictionary,' 9th ed., London, 1948.

[2] 'Broadcast English,' I–VII, London, 1928–39.

[3] *Scottish Geogr. Mag.* 63 (1947) 3.

[4] See J. Berry, in *Proc. and Trans. Third Internat. Congr. of Toponymy and Anthroponymy*, 3 (1951) 471–77.

[5] See W. H. Smyth, 'The Mediterranean,' London, 1854, p. 409, and letters in *The Times*, 8, 13, 14 and 21 July 1944.

[6] The Permanent Committee on Geographical Names for British Official Use, which has its headquarters at the Society's House.

names is small, considered country by country, and they are of two kinds: those known to all educated Englishmen, and those known to Englishmen of special knowledge (sailors, geologists, archaeologists, historians, etc.). A name such as "the Gulf of Danzig" needs no explanation. Everybody knows or ought to know where and what the gulf is. But the name of "Hel Point" (also a feature on the coast of Poland but one without a Polish name), is known only to British sailors who have been in Polish waters.

Little has so far been done beyond the collection of some of the better-known English and conventionally English written forms in the P.C.G.N. "general" lists of European, Asiatic, African and Oceanic names. But the clear recognition of the forms of geographical names which are most acceptable as good spoken English, and of the written forms which are best suited to our closer dealings with other countries, will help to maintain the clarity, precision and character of our language and the dignity of our relations with peoples abroad who do not speak it.

THE EROSIONAL GRADING OF CONVEX AND CONCAVE SLOPES

C. A. COTTON

A RECENT INVESTIGATION by Strahler [1] of equilibrium conditions on certain slopes raises anew the whole question of the origin and development of smoothly graded land surfaces. Not only has there been a very general recognition of concavity in the lower side-slopes of widely open valleys of erosional development, but various authors have pointed out large-scale concavity as dominant in peneplain (and pediplain) profiles. After examining some strictly V-shaped valleys, Strahler claims that a concave profile is never produced by the erosive processes working on slopes. This is compatible with earlier findings of Lawson,[2] but perhaps only because of the stage of development reached in certain rather small valleys (in different districts of mobile California) which have been the subject of both Lawson's and Strahler's studies. It is however claimed by Strahler that "the common illusion" of concavity of slopes "comes from viewing profiles of lateral spurs or other lines which are not true orthogonals." He restates the Davisian concept that at maturity slopes as well as streams are graded. His further claim that "slope profiles are in equilibrium with the channel profiles to which the slopes contribute their debris" is in agreement with current doctrine as expounded by Baulig, Birot, and others; but as it is worded it might lead an inexperienced reader to confuse cause and effect. Geography is indebted to Baulig [3] and Birot [4] for two timely discussions of the theories of slope development.

[1] A. N. Strahler, "Equilibrium theory of erosional slopes approached by frequency distribution analysis," *Amer. J. Science*, 248 (1950) 673–696, 800–814.

[2] A. C. Lawson, "Rainwash erosion in humid regions," *Bull. Geol. Soc. Amer.* 43 (1932) 703–724.

[3] Henri Baulig, "Le profil d'équilibre des versants," *Annales de Géographie*, 49 (1940) 81–97.

[4] Pierre Birot, 'Essais sur quelques problèmes de morphologie générale,' Lisbon, 1949, pp. 17–33.

Henri Baulig's theory of the grading of slopes

Baulig's review of slope problems has been reprinted in his 'Essais,'[1] with an additional discussion in appended notes. Following W. M. Davis, who regarded smooth hill and valley-side slopes as "graded," Baulig recognizes a profile of maturity or equilibrium of slopes such that "the position of any point in the profile depends at any moment on that of all the others"; he points to an analogy with a catenary curve (as in a suspension bridge) in which the application of an additional load at any one point will alter the positions of all points throughout the curve. He stresses the fact that in slope equilibrium, just as in the river profile, all changes will have repercussions not only upstream from the points where they occur, as all are agreed, but downstream also.

The curve of slope equilibrium can develop and be maintained because solid material on the slope moves as a current, which will erode (though not by corrasion) or deposit, so as to smooth out inequalities of slope due to other causes. This current concept implies the loss of material from the slope; the surface is lowered—this has a bearing on the controversy between the advocates of peneplanation and pediplanation. Though by nature mobile and subject to change, the average slope (though not the slope at every point) becomes gentler, approaching more and more slowly a limit it can never attain. By the time the slope loses the irregularity of youth and becomes smooth, its surface is a moving layer of weathered waste; and the mechanism of this movement is mainly creep.

Both rainwash and rill wash (*ruissellement diffus* and *ruissellement concentré*) also transport the surface material—"unconcentrated"[2] and "concentrated" wash. Both can be effective only when the soil is saturated. Unconcentrated wash is described as "minute threads of water always heavily loaded (relatively to their carrying capacity, which is very small), for ever being stopped and diverted from their path by the smallest obstacles, ramifying and anastomosing; they have no definite channel." Concentrated (rill) wash is quite as ephemeral; but it flows in established channels, or shallow gutters, which extend headward, tend to erode furrows and are formed only on lower slopes where the volume of the run-off is increasing.

The compound (convex and concave) curvature of slopes discourages attempts to trace any very close analogy with river profiles. It is reasonable to suppose, as many have done, though not Birot, that the two parts of the slope profile, the convex and the concave, have been shaped by different processes—or rather that different processes are dominant in the two parts. Profiles are largely convex on rocks which, though not necessarily themselves permeable, furnish permeable waste, such as chalk and granite; shales and argillites, being impermeable, furnish broadly concave slopes.

Concavity of slope profile, says Baulig, is almost universally due to the concentration of wash into rills. These rills cut closely spaced furrows of very small depth, which impose a slope profile the same as their own on the crests of the low ridges between them, and therefore on the whole furrowed slope across which they flow.

Factors which control the form of the convex (upper) part of the profile are: (1) the production of debris from the underlying rock by weathering; (2) the progressive reduction of this to finer grades; (3) gravity, which manifests itself through both creep and unconcentrated wash. A sheet of waste is thus dis-

[1] Henri Baulig, 'Essais de géomorphologie,' Paris, 1950, pp. 125–147.

[2] N. M. Fenneman is credited with discovering the activity of 'unconcentrated' wash, see "Some features of erosion by unconcentrated wash," *J. of Geol.* 16 (1908) 746–754.

charged which increases in thickness and becomes finer towards the foot of the slope, and smoothness of the profile may be taken to indicate equilibrium between the factors involved. The production of waste increases or diminishes as the layer protecting bedrock thins or thickens. The physical processes of weathering are more active where the layer is thin or coarse; and where it is thin it is generally coarse also. Chemical disintegration is most effective where the layer is thicker and finer, and thus holds more water. The chemical processes are much less important in the upper, convex, part of the profile than in the lower, concave, part where increasing fineness and impermeability (which result from chemical weathering) favour the concentration of rill wash. Reduction to fine grades is a very slow process and therefore shows its effects only after the waste has been a long time in transit, and especially when it is moving very slowly across the gentle lower slope.

The gravity-controlled creep and the unconcentrated wash become more effective in transportation and in wastage of the surface as the thickness of the waste sheet increases and it becomes progressively finer—but only until the point is reached at which so much debris is of clay grade that concentrated rill wash is brought into play.

Though agreeing in a general way with Gilbert's well-known exposition of Davis's theory of summit-rounding by creep, Baulig would add certain observations: (1) Gilbert might have taken into consideration that successive profiles will not be quite parallel curves; the profile evolves, becoming progressively less steep as the ridge or hill is lowered. (2) A progressive reduction will take place in the calibre, or grade, of the debris which, as it becomes finer, will travel down a slope of uniform declivity with increasing velocity.

The actual form of the profile which is developed depends therefore on various interdependent factors. (1) The rate at which debris is produced by weathering is controlled by the thickness and also by the fineness (or impermeability) of the layer of material covering and protecting the underlying rock. It may also depend on the rate of movement of the layer. (2) The rate of movement of the debris layer, which has a maximum at the surface and is nil at the base, depends on (a) the size of the particles and (b) the thickness of the layer. Particle size varies from the top to the bottom of the layer and from the crest to the foot of the slope; and also with time, or inversely to the rate of movement. Other things being equal a thick layer will, in unit time, evacuate more debris than a thin one, because of the difference in velocity between the superficial and basal parts of the layer. (3) A third factor is the varying cross-section of channels of evacuation.

This elaboration was made to show the difficulty of an analysis in which many variables are involved. To take one of these variables by itself, one may consider the effect of a decreasing rate of production of debris from summit to base of slope as a result of progressive lowering of the summit—one of the points left out of consideration by Gilbert. Less steepening in the down-slope direction would be necessary. If the progressive reduction of the material into finer particles is also taken into account, and also a possible thickening down the slope of the layer in transit, it would seem that the convexity should flatten and perhaps disappear. That it does not commonly do so may mean that some important factor has been neglected, or that erroneous assumptions of variation have been made—some of the variations may take place in opposite directions and so compensate one another.

The pattern of the threads of moving water in unconcentrated wash is an unstable network, and it may give place in exceptional rains to "sheetwash."

On the upper slopes which such wash erodes there are however no furrows such as will be present on lower slopes where wash becomes concentrated. The threads of moving water, formed only on the infrequent occasions when saturation makes run-off possible, are quite fully loaded with fine waste (though not "overloaded," which is impossible). This condition prevents corrasion, or the formation of gutters.

An increase in volume of unconcentrated wash down the slope, always picking up the superabundant fine waste with which it is in contact so as to remain fully loaded, gives increasing power, which depends in general on volume and velocity; Fenneman [1] has claimed that such an increase of power results in a slope that steepens downhill—*i.e.* in convexity of profile. Crudely stated this would imply that by now the slope must have become vertical; but the work done in wearing the slope down will depend not on power alone but also on resistance, which operates as follows. For the same power the corrasion will be greatest on a horizontal surface, and will diminish with increase of slope, because as the slope becomes steeper the grip of the current on it is weakened. Thus the steepness of the slope at any point cannot increase beyond a certain value; but in the downslope direction the gradient will actually be steepened to the extent that a convexity will be formed as a profile of equilibrium controlled by various factors. The argument depends however on Fenneman's assumption that rainwash is the principal agent, the correctness of which is doubtful, at any rate under humid temperate climatic conditions. Applied to the explanation of tropical sugarloaf forms, the argument may on the other hand be a good one.

Another objection raised by Baulig against Fenneman's thesis of the development of convexity by unconcentrated wash is that it does not explain the transition of the convex into the concave part of the profile as a continuous curve, all parts of which are in equilibrium. It treats the convex part as "hanging" above the concave like the segment of a river profile above a fall or rapid—an analogy which cannot be applied to graded slopes because such a river is ungraded.

Baulig's argument diverges from Fenneman's in treating creep as by no means negligible, and as actually more effective than wash in shaping the convex slope. Creep must be the dominant process because it operates in a layer of considerable thickness, whereas the wasting attributable to unconcentrated wash results only from the removal of the finest particles from a superficial film. But for the ancillary operation of creep, the fine particles would soon all be swept away and the wash, which would no longer be fully loaded, would corrade the surface and so become concentrated in little ravines; the profile changing at the same time to a concave form.

Lawson [2] also, though agreeing that the process of hillside grading is "one of transportation, not corrasion," had contended that rainwash was the chief if not the only agent producing convexity, citing examples of rounded summits on which the soil was too thin to creep. In claiming that friction must prevent creep on gentle slopes, Lawson failed to realize that friction does not come into operation between bedrock and the creeping sheet of debris, but only between creeping fragments. Soil will creep down very gentle slopes because, generally, the gentler the slope has become the finer are the particles on it, as a result of prolonged transportation accompanied by progressive weathering. Friction at the base of the layer being negligible, creep is somewhat like movement on ball

[1] *Loc. cit.*

[2] A. C. Lawson, "Rainwash erosion in humid regions," *Bull. Geol. Soc. Amer.* 43 (1932) 703–24.

bearings; in another place Baulig compares creep with the movement of coal at a steady speed down a gently inclined chute that is mechanically shaken. On some slopes at the present day, moreover, the observed thinness of soils is not primitive but is the result of induced soil erosion.

Instead of the continued circular-arc convexity in the profile of a hilltop which is assumed by Lawson, an increase in radius of curvature down the slope may be expected, leading to a point of inflexion and to concavity below. Lawson claimed that the whole lower, concave, slope was due to accumulation. However, it commonly has only a thin covering of soil, the convexo-concave profile being for its whole length one of degradation.

Lawson was able to show that, instead of a point of inflexion in the profile, there is commonly, at least for a time, a portion of the slope which is rectilinear and into which the convex profile above and the concave profile below pass insensibly. While the straight slope exists "soil survival" on it "is just balanced by soil formation" (Lawson), between which there is "equilibrium." Lawson preferred this equilibrium explanation of the straight slope, but he suggested an alternative which Baulig adopts with one modification. It is that "the point of change" from erosion to deposition (Lawson) or that at which unconcentrated rainwash gives place to concentrated rill wash (Baulig) moves "in accordance with variation of rainfall" (Lawson). This point on the profile (or this line along the hillside) may move up and down with the seasons, or may move upslope in more humid and downslope in more arid periods. If it be assumed that the position of the point of inflection depends on the efficiency of concentrated rill wash under local conditions, then the concave portion of the profile should, other things being equal, be broader under a humid than under an arid climate. It should be broadest also on the finest and most impermeable soils, and, generally speaking, where slopes are gentlest, for there the soils will be fine.

The position of the point of inflection will however change as the profile develops—as the landscape passes through early and late maturity and so to senility—for, generally speaking, the slopes will become gentler and the soils finer. Eventually, on a peneplain, convex summits will be quite small and concave slopes dominant. Baulig claims that the recognition of this change corrects and reconciles two contrary opinions: (1) the theory that a flattening of summits takes place as this stage is approached, and (2) the theory that a slope retreats parallel to itself without change of declivity. The curvature at the summit will not however change appreciably until an advanced condition of weathering extends the zone of very fine debris right to the top; this will then cause a real increase in the radius of curvature there.

It can be argued that if, instead of the conditions implicitly assumed above (which are those of W. Penck's "waning" development), valley deepening proceeds at an accelerating rate, then the valley side will steepen and its convex portion extend at the expense of the concave, the straight part of the slope also increasing in length—*i.e.* all the stages of the previous case in reverse. For every rate of valley-deepening there will then be a form of profile stable for that rate.

Pierre Birot's views on the evolution of slopes

Birot [1] prefers Baulig's theory (somewhat modified) to that of Penck.[2] In Penck's theory there is a degree of preparation of material by weathering

[1] Pierre Birot, 'Essais sur quelques problèmes de morphologie générale.'

[2] Walther Penck, 'Die morphologische Analyse,' Stuttgart, 1924.

(*Aufbereitung*) corresponding to every angle of slope, so that while coarser particles remain in place finer particles move. The steeper the slope the larger the proportion of particles (including coarser grades) that is in motion, so that a greater actual bulk of rock material wastes away and is removed. Thus, measured at right angles to the slope, the rate of retreat of steep slopes is large and of gentle slopes small.

The development of a concave profile leading down to a stationary local base-level would take place as follows. A surface layer of a steep valley-wall is weathered and moves down, to be evacuated by a river at the base with the exception of a certain portion at the toe of the slope which remains behind because it is not at a high enough level to be moved into the river by gravity. Figure 1 shows Birot's concept of the evacuation of this layer. Arrows indicate velocities in the portion still remaining, decreasing to zero at the line BC_1, below which the debris remains immobile. At the completion of this stage the portion $BDCC_1$ will have been evacuated, while BC_1B_1 remains; and during the stage the wall retreats from the initial position AB to A_1C_1. The same happens with the next layer of the valley wall underlying A_1C_1, which is prepared by weathering and evacuated by gravity with the exception of a basal portion, and so on with successive layers. The portion left each time is a little higher on the valley-side than the previous one, and these successive basal relics of the wasting wall make a new, less steep, valley-side slope (*Haldenhang*). Its slope is that of the surface of a layer of prepared debris which is still coarse in texture. The preparation of a layer of finer debris from this begins at once and, because it is finer, it can be evacuated over a gentler slope—and so on and so on. The result is that, as the wall and the first developed slope (the *Haldenhang*) retreat from the axis of the valley, other slopes of progressively gentler declivity are formed and retreat in the same way. The integration of all these is the concave valley-side profile.

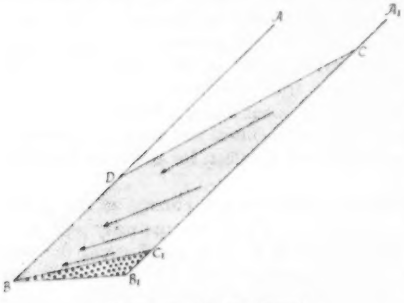


Figure 1. (after Birot)

Where the local base-level is not fixed but, instead, valley-deepening is in progress, perhaps at varying rates, a separate investigation would be necessary; but Penck's case of "waning" development approaches that of fixed base-level.

Penck's contention that valley-side slopes retreat strictly parallel to themselves is based on an erroneous assumption that there is no limit to the rate of evacuation of debris once it has been prepared by weathering. In reality some of the debris, remaining unexported, will form a layer which increases in thickness down the slope (at any rate in humid temperate regions) and, by increasing the depth to bedrock, this will affect the rate at which further debris is prepared for removal. As a result, the slope will not waste back parallel to itself but will become less steep as it retreats.

No serious modification of Baulig's theory (outlined earlier) of the *convex* slope is suggested by Birot, except that he does not place so much emphasis on the dominance of creep. He does not however agree with Baulig's theory that

concentrated rill wash shapes the *concave* portion of the profile. This he regards as developed by the same gravity-controlled processes—creep and diffused rainwash—which are responsible for shaping the higher convex slope. Faced with the problem of change from convexity to concavity at the point of inflexion, he explains that this is due to a progressive increase in impermeability and at the same time an increase of mobility in the layer of waste.

As regards impermeability, run-off will increase as the debris becomes finer and more impermeable. If rills were to develop they would carry off the finest colloidal debris, the loss of which would reduce impermeability; but on the whole impermeability and run-off increase downslope. Rapidity of creep is governed by the amount of water of infiltration, or varies inversely as the run-off.[1] As regards mobility, to think of this in terms of the increasing fineness of waste allowing its transport down a gentler declivity (by analogy with a graded river profile) assumes validity of the rejected theory that running water is active in shaping the profile; some other concept of mobility is therefore required.

Figure 2 explains a theory of concave-slope development which requires no transport by running water (rill wash). AB is a valley-side slope. If the deepening of the valley during which this slope had been developed were assumed to continue at the same rate (Penck's concept of "uniform development") so that the deepening in unit time was BB′, then it might also be assumed that a layer of material down to A′B′ (parallel to AB) would be decomposed, or prepared for removal, in unit time, while below A′B′ the rock would be fresh. The deepening of the valley does not however go beyond B, and the material is quite immobile (unprepared) below m_0. Above this the parallel lines m_1, m_2, and m_3 are lines of equal mobility, or preparedness, in the weathered zone at a gentler inclination than AB. (If movement were free, these would be lines of equal velocity of evacuation.) Gravity movement of the material downslope by creep and unconcentrated wash, which would have evacuated the whole layer down to A′B′ if deepening of the valley had continued, is blocked at B. In a thin moving layer (shaded in the figure) which is bounded above and below by surfaces of equal mobility, the lowest part, at the point 1, is prevented from moving at all; at points 2, 3, etc., the movement is in the direction of the arrows. For successively deeper layers of moving material the line of zero velocity starts at B and traces the curve BV_0. This is arrived at by picturing the evacuation of weathered material in the direction of the arrows and at velocities proportional to the lengths of the arrows. Points near B are in the zones of higher mobility (m_3), which implies that here the material is mobile on the very gentle slope at the B end of the curve. Deeper and coarser, and thus less mobile, layers of

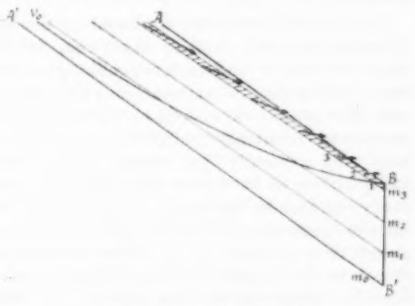


Figure 2. (after Birot)

[1] This point has been disputed by Baulig in his 'Essais' if it is meant that water running off as rainwash is subtracted from the water of infiltration; rainwash runs off only when the soil is saturated, and it is then that the movement of water below ground by percolation is most active.

waste require steeper and steeper slopes for evacuation; so that the valley-side profile which results is the concave curve BV_0, tangent to A′B′, the bedrock surface, at which the mobility is zero.

Once concavity of the lower profile is established, its maintenance depends on the cooperation of several minor factors: (1) The gentler the slope the greater is the volume of precipitation caught on each unit of surface to augment the discharge of water down-slope. (2) The movement of waste becomes slower as the declivity diminishes, so that there is more time available for the breaking down of the debris to finer grades. (3) There is greater impermeability on the lower slopes.

As the thickness of soil diminishes up-slope, the rate at which the bedrock is wasting away increases; the point of inflection in the convexo-concave profile would tend to be established high enough up to ensure that the wastage of bedrock is considerable. Its position is influenced also by the position of the zone at which the concave curve of the lower slope leading down to the local base-level approximates to a straight slope (V_0); and this position depends on such valley-deepening as may be going on. Equilibrium between these two controls fixes the point of inflection.

Conclusion

The foregoing theories are based on the wide experience of competent geomorphologists whose field experience in the examination of concave and convexo-concave land-surface profiles prevents their acceptance of a generalization which denies the existence of such forms. Broad convexity of upper slopes and hilltops is obvious even to untrained eyes, and concavity of valley sides is also found commonly enough to merit serious attention and thought. It will be held very generally that straight slopes on the sides of minor, submature valleys, such as have been the subject of Strahler's very interesting statistical study, cannot be accepted as reproducing in miniature the profiles of fully mature landscapes. It is impossible to believe that a long succession of competent field observers from Gilbert onwards, through Davis, Fenneman and Penck, to Baulig and Birot, have been deceived by a concavity of profile which Strahler claims to be "commonly [but mistakenly?] shown in elementary textbooks."

GEOGRAPHY IN JUGOSLAVIA

J. ROGLIĆ

BEFORE THE WAR of 1940–45, scientific and professional geographical work in Jugoslavia was largely concentrated at the universities. There were chairs of geography at Ljubljana, Zagreb, Belgrade and Skopje, and a brief account will first be given of each of these centres in this period.

It was due largely to the work of J. Cvijić, Jugoslavia's most outstanding geographer, that geography was established as a university subject in Belgrade. His work on the rocks of the Dinaric and Rodopi systems drew a large number of students to his school, and Cvijić's work subsequently influenced the whole of Jugoslav geographical thought. After his death the Belgrade school, under the leadership of his successor, B. Ž. Milojević, concentrated on the study of the regional geography of Jugoslavia. Professor Milojević concerned himself with the regional geography of four main "landscape" features—the coastal lands, the high mountains, the river valleys and the Pannonic lowland, and he had already published essays about the first two before the war broke out.

The Belgrade school was associated with the Serbian Geographical Society (*Srpsko geografsko društvo*) which was founded in 1910 by Cvijić. In 1918 this became the Geographical Society in Belgrade, but in 1948 its name was changed once again to the Serbian Geographical Society. The Society began the annual publication of its journal, *Glasnik Srpkog geografskog društva*, in 1912 but since 1948 it has been published half-yearly. The contents of the journal record the development of the Belgrade school and reflect the nature of its activities. In 1927 the Society widened the scope of its publications to include supplementary papers edited by B. Ž. Milojević; twenty-four volumes had been published in the series *Posebna izdanja* (separate editions). In addition there were five volumes of *Memoires*, seven volumes of *Mala biblioteka* (small library), five maps in the series *Karte* and thirteen volumes in the series *Atlasi* (atlases). All this work was published between 1927 and 1939, when Belgrade was the centre of geographical research in Jugoslavia.

The Geography Department at Skopje, established in 1921, was closely linked to that of Belgrade. Before the war the professors were P. S. Jovanović and V. S. Radovanović, both students of Cvijić, who worked in accordance with the ideas and methods of his school. Most of the work they published was on Macedonia.

The first chair of geography at Zagreb was established in 1883 and, although the first Professor, P. Matković, may be said to have initiated the modern study of the geography of Jugoslavia, Croatian geography suffered a decline after his death. It remained in a subordinate position relative to other faculties and the very professors were often working on non-geographical subjects. Here geography was characterized by a dualistic character which proved detrimental to its development. There were actually two geographical departments at Zagreb at the beginning of the Second World War; one under the direction of M. Šenoa devoted to regional geography, and the other under A. Gavazzi concerned with hydrography and climatology.

During this period the Croatian school had no professional association of its own, but Gavazzi, after a short period as professor in Ljubljana, came back to Zagreb and founded the *Hrvatski geografski glasnik* (Croatian Geographical

Journal) in 1927. Ten numbers had been published up to the outbreak of the Second World War.

The University of Ljubljana was not established until after the First World War, but in spite of this late start geography made rapid progress and within a short time attained remarkable success. Gavazzi came from Zagreb as the first professor and gathered around him a number of young and active workers. A geographical society was founded, and by 1925 the first number of the *Geografski vestnik* (Geographical Reporter) had been published. In 1927 Gavazzi returned to Zagreb and A. Melik, a distinguished worker on the regional geography of Slovenia and of Jugoslavia, took his place.

The capitulation of Jugoslavia and the German invasion brought geographical work to a complete standstill. The universities virtually stopped working, the geographical societies were forced to relinquish their activities and nothing was published. The professors and lecturers retired or, as in the case of Skopje, had to abandon their place of activity. The prominent Slovenian geographer Jože Rus died at Buchenwald; Vasa Ruvarac, compelled to leave his home at Zagreb, committed suicide. Vasa Matić of Belgrade, exhausted after a long captivity in a German prison camp, died just after returning to his native country. The partisan struggle also took a heavy toll of the younger geographers.

The greatest single material loss during the war was the destruction of the headquarters of the Geography Department at Belgrade, for before they withdrew the Germans fired the University buildings. The Geographical Institute, the library, all the spare publications of the Institute, as well as Cvijić's private library which he had bequeathed to the Geographical Society, all perished, and the Belgrade school was left without a building.

Geography in the Universities after the War

After the liberation, all the departments of geography at the universities were reorganized and a considerable expansion took place. The pre-war centres revived and a fifth university department was established, at Sarajevo, in 1950. Altogether, there are now about 900 university students reading geography, although only a fraction of this number succeed in graduating in geography because standards have not been relaxed.

At all the universities, geography teaching has been modified with the aim of encouraging the development of Honours Schools. This has meant big changes in the teaching of subjects allied to geography which, in Jugoslav universities, were formerly read as part of the course leading to a degree. Geology and meteorology for example, on the physical side, and economics, sociology and history, on the human side, have now been made subservient to geography within the department. Instruction in these subjects is given only to an extent considered necessary to the needs of the geographer.

As part of the reorganization it was planned that each department should be able to provide its own lectures on subjects allied to geography as well as the geographical courses proper. The considerable staff, not to mention equipment, necessary for such an experiment has not yet been found and, in practice, the departments still rely on extra-departmental courses for instruction in geology, economics and so on. Even so, specialization in geography is much greater than it was before the war.

The reforms do not lay down any rigid pattern, and individual departments are left to develop along their own lines. At the University of Belgrade for example, students may elect to specialize in different branches of geography during their course of study and this system has been followed at Skopje and

at Sarajevo. At Zagreb on the other hand, the unity of the subject is emphasized and specialization in different branches of geography is allowed only after an all-round training has been given. At Ljubljana two kinds of examination are open to students—a general one intended for the teacher and another intended for the specialist. Thus, although the new geography teaching is based on the same foundation in all the universities, tuition by no means follows a set pattern.

There are four professors of geography at Belgrade. P. S. Jovanović (geomorphology) and V. S. Radovanović (human geography) both formerly at Skopje, have joined the Belgrade staff. The head of the department is still B. Ž. Milojević who specializes in regional geography. The fourth professor is S. M. Milojević (physical geography).

The other universities have two professors each. The head of the department at Ljubljana is A. Melik, whose interests are in physical and regional geography —his 'Jugoslavije' (a regional geography of Jugoslavia) was published in 1948; his colleague, S. Ilešič, specializes in human and regional geography. At Zagreb, J. Roglić, who is in charge of the department, is largely engaged in research into the physical geography of the *karst*, while J. Rubić is interested mainly in human, and especially urban, geography. At Skopje, both A. Urošević, the head of the department, and J. F. Trifunoski specialize in the regional geography of Macedonia. The professors at Sarajevo are H. Brkić and P. Kanaet.

In addition to their individual research at the universities, all these geographers are collaborating in the preparation of a four-volume survey, 'Priroda i privreda Jugoslavije' (the physical structure and economy of Jugoslavia).

Geographical Societies

Beside those in existence before the Second World War, several new societies have now been created so that each Republic of Jugoslavia except Montenegro now has a society. In Montenegro there is a geographical section of the Society for Natural Sciences. These societies play an important role both in encouraging scientific research and in popularizing the subject. They collaborate with the republican boards of education in such matters as providing lecture courses, and solving the special problems of school geography. The three bigger societies continue to publish their journals as before.

The Geographical Institutes of the Academies

The chief function of the two Geographical Institutes is to carry out and publish research in geography; they have their own staffs and equipment. The larger, founded in 1947, is the Geographical Institute of the Serbian Academy of Science, under the directorship of P. S. Jovanović who is also a university professor. It has a large permanent staff and ample funds at its disposal. It has published three monographs, *Posebna Izdanja* (separate editions) and two volumes of *Zbornik-radova* (transactions). Each paper in the *Transactions* has a French summary.

The Geographical Institute of the Slovenian Academy of Science and Arts was founded soon afterwards under the directorship of A. Melik, Professor of Geography in the University of Ljubljana. It has published two monographs, one on field-systems in Slovenia, by S. Ilešič, and another on the pastures of the Julian Alps, by A. Melik.

There is no comparable institute of this type in Croatia because the Jugoslav Academy of Science and Arts holds the view that research work should in future remain centred at the Universities; but institutes have been created in

which geographers have a special interest. Thus the Adriatic Institute was founded specifically to carry out research on aspects of the Jugoslav coastal region. A number of essays on the problems of the Julian region have already been published by geographers and others, and some have been translated into French. Another project to which geographers are contributing is the study of the *karst* region.[1] Also worthy of mention is the Lexicographical Institute of Jugoslavia which is centred in Zagreb. Here a large staff is engaged upon the production of an Encyclopaedia of Jugoslavia; geographers are making a substantial contribution toward the Maritime Lexicon published by that Institute. Such projects call for the collaboration of many specialists in different fields and often involve applied as well as pure research.

The Council of Geographical Societies

In 1949 the various republican Societies formed a Council for mutual collaboration; in February 1952 a National Geographical Committee was set up under the leadership of A. Melik to cooperate with the International Geographical Union. The Council itself organizes, through the republican Societies, the various congresses of Jugoslav geographers. Geographical congresses were indeed held before the war, but the post-war congresses have attracted far greater numbers and have been on a much more ambitious scale. It is the practice to invite foreign guests and to publish a report (*Kongresi geografa Jugoslavije*). The Geographical Societies of Zagreb and Ljubljana collaborated for the Rijeka-Pula-Gorica Congress of 1949, and the Macedonian Geographical Society organized the Skopje-Ohrid Congress of 1951. The Bosnian Society will undertake the organization of the next congress at Sarajevo.

Cartography

In order to meet the great increase in the demand for maps and equipment from geography teachers, new institutes of cartography have been developed to make Jugoslavia self-sufficient in essential maps, globes and relief models, all of which were formerly imported. In this field, the firm of *Učila* in Zagreb has made considerable progress. It has so far produced a school atlas and a variety of physical wall-maps of the continents, of Jugoslavia, and of the individual republics. Other devices such as a 33-centimetre globe and a contour demonstration set have also been produced. *Učila* is also concentrating on the preparation of relief models of Jugoslavia, and of its different regions, on scales varying between 1 : 200,000 and 1 : 500,000. In Belgrade there is the *Geo-Karta* Institute which is engaged upon extensive geodetic and cartographic work, but also produces school maps and atlases. The Geographical Institute of the Jugoslav Army (Belgrade) also publishes topographical maps. Its new map of Jugoslavia (1 : 750,000) is widely used for general purposes as well as for teaching.

Finally there is the cartographic section of the State publishing house of Slovenia which has so far produced a useful hand-map of Jugoslavia on a scale of 1 : 500,000. A map of Slovenia on the scale of 1 : 300,000 is in the press.

Conclusion

Geography in Jugoslavia to-day may be said to be in a healthy condition. It has already made up a great deal of ground lost during the war, and Jugoslav geographers, working in accordance with their fine pre-war tradition, are

[1] The Jugoslav Academy in Zagreb has formed a commission for the scientific exploration of the *karst*, on which representatives of all the sciences interested in the problem will collaborate. The Chairman is M. Salopek, a geologist.

developing special methods, widening the basis of the subject and adapting it to their particular circumstances and needs. The main difficulty in the realization of their aspirations lies in the inadequate number of qualified specialists and in lack of equipment. But the much greater material support given by the State, a widening public interest and the steady stream of younger specialists coming from the universities are all helping to overcome these deficiencies. All this activity would seem to promise that Jugoslav geography will not fail to make its contribution to general scientific progress.

The R.G.S. Library has sets of the periodical publications of the Yugoslav geographical societies referred to by Professor Roglić. They are mostly complete, except for volumes of the war years as noted here.

Geographical Society of Belgrade: *Journal* (Glasnik Srpskog geografskog društva), 1 (1912)—24 (1938); 27 (1947) and on. *Special editions* (Posebna izdanja), 1 (1929)—22 (1938); 24 (1941) and on. *Atlases* (Atlasi), 1 (1929)—13 (1935). *Maps* (Karte), 1, 2, 5 (1931–36). *Mémoires*, 6 (1950) only. The Library also has the two works published *hors de série*, in the French versions: B. Ž. Milojević: 'Hautes montagnes' (1939), and P. S. Jovanovic: 'Les profiles en long' (1940).

Croatian Geographical Journal (Geografski glasnik, formerly Hrvatski geogr. glasnik) Zagreb, 1 (1929)—12 (1950).

Geographical reporter (Geografski vestnik), Ljubljana, 1 (1925)—23 (1951).

A list of titles in the above series and of recent geographical works on Yugoslavia, compiled by Professor Roglić, has been placed in the Library for reference.—*Ed. G.J.*

SOME DEFINITIONS IN THE VOCABULARY OF GEOGRAPHY, III

THE THIRD LIST of definitions by the British Association Glossary Committee deals with terms relating to agriculture which are in common use in geographical works.

Agriculture. The science and art of cultivating the soil, including the rearing of livestock.

Agricultural area. The area of land utilized for farming, including arable, improved or unimproved grassland, and other pasture.

Arable land. Agricultural land which is tilled for crops, not necessarily each year, *e.g.* plough-land, gardens, vineyards, temporary fallow and rotation grass.

Tillage. 1. Land ploughed or hoed during the current year. 2. The process of cultivating the land.

Grassland (grass). Land under grasses, legumes or other herbaceous plants for hay or grazing.

Rotation (temporary) grassland. Grass grown for one or more years in rotation with other crops. See also *Rotation.*

Meadow. In Britain, rich grassland; especially grass to be mown as hay.

Water meadow. Meadow naturally or artificially inundated for part of the year.

Grazing. Any land, whether grassland or rough grazing, primarily used for grazing animals.

Rough grazing. Unimproved grazing, including *e.g.* moorland, scrubland, salt-marsh, mountain pasture.

Pasture. Grazing (*q.v.*); in Britain, usually grassland.

Bare fallow. Arable land left uncropped for one or more growing seasons.

Market gardening. The intensive production of vegetable crops, soft fruit, or flowers, for sale. (Equivalent to "truck-farming" in American usage.)

Intensive agriculture. Farming in which large amounts of capital or labour are applied to a given area.

Extensive agriculture. 1. Loosely used of farming in very large units. 2 (in economic geography). Farming in which the amount of capital and labour applied to a given area is relatively small.

Productivity (*of land*). 1. Actual productivity; the equivalent of yield. 2. Potential productivity; the hypothetical yield under stated conditions, especially under the best conditions possible.

Production. Total output measured in absolute terms.

Yield. Output or production expressed in relation to units of land or livestock, or to units of capital or labour applied.

Crop. 1. Plants grown or gathered for food or feed, or other purposes; sometimes used of animal produce. 2. The produce of such plants or animals.

Holding. In agriculture a unit of land occupancy, not necessarily occupied by the owner or necessarily all in one piece.

Crofting. The cultivation of small patches of land entirely or almost entirely for subsistence, particularly in Scotland; usually practised in conjunction with other part-time occupations.

Mixed farming. Farming in which both arable crops and livestock play considerable parts in the economy.

Mixed cultivation. The growing of two or more different crops intermingled on the same field or plot, especially the mixture of tree and ground crops.

Horticulture. The cultivation of vegetables, fruit, or flower crops, often on very small plots, with a higher intensiveness than in field cultivation; sometimes used of nursery gardening.

Subsistence agriculture. Agriculture the final products of which are not primarily for sale, but are mainly consumed in the farmer's household; the opposite of commercial agriculture.

Cash crop. A crop which is mainly for sale off the farm, and not for consumption by livestock or in the farmer's household.

Catch crop. 1. A crop grown during a short period of the year when the ground is not occupied by any of the main crops. 2. Ground-crops grown before a main crop of trees or shrubs reaches maturity.

Rotation. A systematic succession of different crops on the same land.

Marginal land. Land which yields an average return no more than sufficient to cover the cost of production.

Monoculture. Cultivation in which a single crop preponderates over all others; generally used in respect of a region or large area.

[The first two lists of definitions were published in the December 1951 and March 1952 issues of the *Journal*.]

FROM THE *JOURNAL* A HUNDRED YEARS AGO

AT THE ANNUAL General Meeting of the Society on 24 May 1852, Sir Roderick Impey Murchison, F.R.S., then in the second period of his long continued Presidency, concluded his Address (*Journal of the Royal Geographical Society*, vol. 22, pages lxii–cxxvi) with the hope that "your future volumes may expand to the dimensions they attained in those days when, in the ardour of our pursuit, we forgot that our means were not as national as our objects." He went on to say:

> "In truth, the twenty-one volumes of the Journal are the records of the dignity and usefulness of this Society. For although they contain some papers to which rigid critics may object as not coming strictly within our domain, it must be recollected that in a Society constituted like our own, the tastes and pursuits of many individuals who look at geography after their own manner, must be consulted; and thus it is that neither our numbers nor our spirit can be maintained, if our publications do not embrace ancient as well as modern geography, occasional descriptions of the produce of newly discovered lands which may be useful to the mercantile community, and accounts of the habits and languages of distant people.
>
> On the other hand, the pure physical geographer will rejoice to see that we have been accumulating valuable meteorological and astronomical data, which will form a good element in the construction of future publications, which we may now hope to see strengthened by the help of one of the leading terrestrial magneticians of the day, who has recently joined us.[1]
>
> Our volumes have, indeed, always seemed to me to be attractive and valuable, particularly as works of reference, precisely in the ratio of their varied composition. In them the scholar finds conveniently bound together stray leaves nowhere else to be met with, which explain or illustrate the classical writers of antiquity in the countries of Greece, Asia and Egypt. Some of the most valuable of these have proceeded from the pens of our military associates, and others from surveying naval officers; so that, whatever may be the result of the new system of warlike education, it is gratifying to one who, like myself, can count back to the old stirring times, to appeal to works of many, whose attainments in learning were acquired under the régime of a Nelson and a Wellington."

[1] This would be Colonel [afterwards General Sir Edward] Sabine, F.R.S., who had been elected a fellow of the Society on May 10.

THE REGIONAL GEOGRAPHY OF BRITAIN

DIE LANDSCHAFTEN DER BRITISCHEN INSELN (Erster Band: England und Wales). By JOHANN SÖLCH. *Vienna: Springer-Verlag*, 1951. 10×7 *inches;* xii+850 *pages; maps, diagrams and illustrations.* £8 12*s*

IT IS MOST undesirable to consider this study without reference to the scholar who wrote it and the circumstances in which he worked. Johann Sölch was well known to many students of these islands, geographers, geologists, historians, economists, sociologists and others; to some he was a close and personal friend. It was tragic that his death came so soon after the publication of the first volume of a work to which he had given much of his time and energy and into the preparation of which he had entered so enthusiastically. Few scholars can have equalled his determination and persistence in the face of so many serious and almost overwhelming setbacks. Those who read his work now or in succeeding years must recognize that a quarter of a century was devoted to the study of a wide range of literature, to painstaking field work and to overcoming many difficulties. They must also appreciate that Sölch came to know these islands and their people with an intimacy many may well envy. It was characteristic of the man that he was always so ready to acknowledge the help given him by colleagues in Britain—and it is very true that all who tried to help him, in the field and in the library, found that the combination of his personal charm, his scholarly qualities, his attention to detail and quick grasp of facts led to mutual understanding and benefits. But in addition it is necessary to emphasize that the labour of years was secured for other students by a narrow margin. It was not long after Sölch had occupied his Chair of Geography at Vienna that Hitler, and later the Russians, descended upon Austria. Sölch had made good progress with the first sections of this work but in the succeeding years the difficulties grew greater and greater. The havoc of war nearly destroyed all that had been prepared but a measure of good fortune, together with his quiet courage and determination, made it possible to produce the first volume and to set the second well on its way. Post-war Vienna cannot have provided the ideal setting for a virtually new start to be made and for so many gaps to be filled; and the claims on Sölch's time over one of these years when he was Rector of the University of Vienna added to his difficulties. There are obviously good reasons for considering what the *doyen* of Austrian geographers was able to achieve under both difficult and disturbing circumstances.

And now one must turn to this first volume of this study of the British Isles. It is devoted to England and Wales and runs to over 800 pages of text, maps, photographs and tables. To do justice to this work in the normal space of a review is an exceedingly difficult and well-nigh impossible task—and the task is the heavier since this work is known to be the product of so sincere, honest and scholarly a man. In any case, until the second volume appears, this can be but an interim note.

Sölch makes his contribution to the regional geography of England and Wales through the close and detailed analysis of a series of major units. These are of interest and demand to be named here. Twelve are identified and constitute the chief chapter headings. South East England, the London Basin, and London itself, make up the first three chapters, followed by a composite chapter on Wessex, the Isle of Wight and the Channel Islands. Following a study of South West England, comes one on 'Middle East England,' divided into a

section on East Anglia and one on the Fenlands and Lincolnshire. The Midlands fall, as Sölch sees this part of England, into southern, north eastern and western divisions. North East England extends from Humber to Tweed while to the west of this region lies his 'Middle North England,' the Pennines comprising the major part with a lesser section represented in the area extending north of the Tyne Gap to embrace the Cheviots. 'Middle West England' comprises Lancashire and the Welsh Marches whilst North West England has as its kernel the Lake District with a peripheral border from Morecambe Bay to the Solway Firth. Finally comes a chapter on Wales divided into three sections, north, middle and south.

He plunges immediately into the study of these regions of England and Wales. There is no preliminary, overall assessment, no attempt generally to discuss and argue the case for these regions in advance of the consideration of each of them. There is no map of England and Wales to show their boundaries —and no systematic presentation of maps of individual regions defining their boundaries in precise terms. Sölch knew and appreciated earlier and more recent studies of the regions of Britain. The examination of administrative and other types of boundaries was an interesting exercise but in his own definition of the units of study he clearly preferred both to rely upon his own assessment of the blending of physical and human circumstances and to let the facts of his analysis speak for themselves.

No one with a knowledge of him would expect other than a legitimate stressing of the physical background. At the same time Sölch understood and felt the long sustained if spasmodic events of human adjustment and adaptation. The systematic and thorough technique of portraying the characteristics of the regions he defined reflects his attitude of mind and approach. Prefacing the individual study is commonly what may be described as a thumb-nail sketch of its general character and extent. Following this is the progressive build-up of the regional picture through the systematic examination of, for instance, structure and land forms, climate, soils and vegetation, the facts of settlement and development, the contrasting but complementary units within the whole. The detail is very considerable and perhaps much of the character of this publication may be indicated by the view that the relevant map sheets of the Geological Survey and the Ordnance Survey are necessary in the reading of the individual chapters. So we may find, as a colleague has expressed it,[1] that the regional picture presented may be almost too full to be digested. But if the reader continues with something approaching that persistence which characterized the author he will find that not only has he had the opportunity to acquire a great mass of detail but he has had a regional picture presented to him both on the basis of logical scientific method and through assessment by personal impression.

It is obvious that this work on Britain by a leading Continental geographer has many aspects of interest, among them the methods of presentation adopted, the broad regions defined, the range and accuracy of facts and assessments and the nature of the literature used. Scanty and inadequate mention has been made of some of these. There is no intention now to comment in detail on matters of accuracy and those who appear to relish this type of criticism must look elsewhere and might well be asked what measure of human perfection they are entitled to expect. It is obvious that at least two things must be borne in mind. When the detail is really so great then almost inevitably the error factor

[1] J. W. House, 'Some thoughts on Man and Method in regional geography.' *J. King's College (Durham) Geogr. Soc.*, No. 3, 1951.

is increased; while the simple fact that so many and such significant changes had occurred in Britain after Sölch had completed the first draft of his work suggests that readers may be provoked to make their own amendments. The individual chapter bibliographies speak for themselves; they are a valuable record of the many and contrasting contributions made to the knowledge of this country—and it is not without significance that they also portray the measure of specialism in the work of some geographers.

This book must be very closely studied if there is to be an understanding of Sölch's conception of the regions of England and Wales and of their characteristics; and to decide how far a true and real picture emerges. The task will be far from easy for it is hard reading; but then and then only may the reader decide for himself what additions or alterations he would wish to make (perhaps more particularly in respect of very recent events) and how far these substantially influence the regional picture produced by Sölch through the use of his disciplined technique.

But as we consider this first volume of a sustained study of our islands it must be admitted that language, size and cost (an item that caused Sölch much worry) may prove strong deterrents to its really wide and regular use. It may well be that these facts will combine with its other characteristics to make it more strictly a reference than a textbook. Yet, and in advance of the fuller judgment that should be made only when both volumes are available and the work can be assessed as a whole, some thought may be given to the implications of this regional study of Britain by an Austrian geographer. Mackinder, Demangeon and Sölch have given us significant and important studies of these islands, each in his own fashion and style, and with the two last named representing in so doing their respective schools of thought and approach. Mackinder stands alone amongst us—but the gap between then and now widens steadily. Can one hope that it will not be too long before a British geographer will give us a regional study of these islands of such quality and character that we should be justified in adding a fourth name to these three? Meanwhile there is every reason to study this first volume and, when the second volume on Scotland and Ireland is before us, to attempt an assessment of the whole. G. H. J. DAYSH.

REVIEWS

EUROPE

ITALIAN MERCHANTS AND SHIPPING IN SOUTHAMPTON, 1270–1600. By A. A. RUDDOCK. *Southampton: University College*, 1951. 8½×6 *inches; 300 pages; illustrations.* 25*s*

With this volume the publications of the Southampton Record Society have been resumed after a lapse of a dozen years during and since the war. While the bulk of the Society's work has consisted of printing and publishing the ancient documents of the borough, many of which are of unique historical interest, the present series has started with a scholarly study of a particular aspect of the town's history.

The trade of England with the Mediterranean was in the hands of Mediterranean merchants, mainly Italians, from the time of the opening up of direct trade through the Straits of Gibraltar, at the end of the thirteenth century, till the closing years of the fifteenth century, when their monopoly was broken by the competition of English ships—a process contemporary with, but independent of, the discovery of the sea-route to the Indies.

During most of this period Southampton occupied a leading place in the Mediterranean trade. It is natural to ask why Southampton should have been preferred to London, a port almost equally well placed for the export of Cotswold wool (the finest in Europe and the chief objective of the Italian trade) and a better port for the distribution of alum and other raw materials for the English cloth industry or the luxury goods which found their main market in the capital itself. The advantage of Southampton lay partly in its position on the highway to Flanders, the principal northern emporium of the period; but more decisively in the difficult navigation of the Thames estuary in the unwieldy cogs and carracks which carried most of the trade from the end of the fourteenth century on. It was also a change in the technical conditions of navigation that ruined Southampton in the fourth decade of the sixteenth century. Improvements in the rigging of ships, and the establishment of Trinity House, rendered the Thames passage safe and swift; with the result that merchandise, which had formerly been landed at the out-port of Southampton and then transported seventy miles overland, was now carried by water direct to the quays of London.

The greater part of a work of this kind is inevitably of more interest to the historian than to the geographer, even the historical geographer, since the intention is to study a particular aspect of the trade of a particular port, a theme which leaves little room for those comparisons of place and place that are essential to the geographical point of view. Apart from a chapter "The commodities of trade," which includes a consideration of the provenance of the English exports, the chief value of the book to the historical geographer will be as a source of detailed and documented evidence for the methods and customs of a particular branch of commerce during the late Middle Ages. And broad geographical generalizations may prove misleading unless they rest on such solid foundations of familiarity with the day-to-day realities of commercial life and organization.

G. W. S. R.

WALES IN MAPS. By MARGARET DAVIES. *Cardiff: University of Wales Press*, 1951. 10×7½ *inches; 111 pages; maps and diagrams.* 7*s* 6*d*

This book aims at providing that essential link between the last year of school work and the first year at college, and should therefore be welcomed by schools,

colleges and the university alike. In scope it is adequate, and deals with the physical and historical geography, agriculture and settlement, commerce and industry and population of Wales. Although the historical section appears slight with only four maps, much historical geography is included when dealing with settlements and with commerce and industry.

The selection of data is good, and its treatment commensurate with the writer's aim. Description tends however to outweigh analysis, particularly in the cross profiles (Figs. 4 and 5), and in the village and town plans where a simple classification on genetic, morphological or functional grounds might have been attempted. The line drawings of the landscape are excellent, and present an ideal technique for geographical synthesis.

The juxtaposition of map and text is good, though it sometimes leads to an over-reduction of the maps (Figs. 3 and 72), and necessitates a style which is somewhat clipped. Over simplification of the symbols in Figure 65 masks the relative importance of industries in country towns, while the poster technique of Figures 62 and 89 mars the otherwise good standard of mapping. A scale showing actual numbers of ships would clarify Figure 59. Some minor factual errors occur; Machynlleth is not the lowest bridging point (p. 57); and Montgomery was a walled town (Fig. 26).

This book makes an individual contribution to the knowledge of the Welsh landscape, and it is to be hoped that schools within and outside the Principality will appreciate its value. J. G. T.

THE KINGDOM OF FIFE. Edited by THEO LANG. *London: Hodder and Stoughton*, 1951. 8×6 *inches;* xiii+238 *pages; map and illustrations.* 15*s*

This, though mentioning only Fife in the title, includes Kinross and is mainly a collection of antiquarian tit-bits and odd legends and tales about famous historical personages. Those who enjoy such snippets will find the book interesting enough and the alphabetical arrangement facilitates reference. There is however no attempt to fit the pieces together and to show a comprehensive view of either the history or the geography of the area; nor can the reader do this for himself for many of the vital pieces are missing. For example, the Fife coalfield is in many ways unique, and the new Comrie pit a model for Britain, yet no "romance" is seen in this though otherwise the word seems to occur on every page. Fife builds and operates probably the finest fishing-boats in the United Kingdom, but these are not even mentioned.

There is a large number of excellent photographs, and an end-paper map showing place-names but without representation of relief. R. M.

THE SCANDINAVIAN STATES AND FINLAND: a political and economic survey. Edited by G. M. GATHORNE-HARDY. *London: Royal Institute of International Affairs*, 1951. 8½×6 *inches;* viii+312 *pages; maps.* 21*s*

This political and economic survey of the Scandinavian states and Finland, prepared by a small group under the chairmanship of G. M. Gathorne-Hardy, brings our knowledge of the north European scene as up to date as is practically possible. To handle rapidly changing political and economic material is a distracting task—the more so when the publication of the final work coincides with a new censal year. This round table study will date too; but it will stand as a milestone in the British appreciation of Scandinavia. Chapters similar to those composing this book are to be paralleled in our best and newest encyclopaedias; but it is rare for such contributions to attain the felicity of style which frequently graces the chapter on Norway.

The book falls into six parts. The five constituent states are treated syste-

matically, following an introduction which points out the differences as well as the likenesses of the lands embraced by "the somewhat loose epithet Scandinavia." Most of the material covers political and social topics, so that the human geographer who would employ it to supplement his information will have to read selectively. A book covering such a wide area and conforming to a systematic pattern necessarily repeats the detail of a variety of other publications. Such a compilation (one may concede with Bottom) will contain things which will not please. Thus, the Finnish agrarian would deny that "little ground that is suitable for cultivation remains unused" (p. 116); while Swedish agriculturalists might not agree that "there is no further prospect of land being brought into use" (p. 278). The peatland specialists of Finland and Sweden would certainly testify to hundreds of thousands of acres of potentially cultivable farm land, but it is of course easy, and a little unfair, for the critic to quibble over such statements; where several schools of thought prevail, information may have been drawn from only one. Parallel comment might be made concerning other estimates (*e.g.* hydro-electric power potential—a most elusive figure).

The sources of information for such a factual volume will frequently have been official channels, so that the welcome bibliography is largely supplementary to the text. Glancing through its pages the omission of academic periodicals and the publications of the learned societies cannot however fail to be noticed. In many respects these are signposts to the future and, because they are printed in English or have English summaries, they represent a mass of accessible material (not least in the economic and social fields). It is particularly noticeable that the great atlases of the northern countries are omitted from the bibliography—volumes essential for the appreciation of the geographical background and the distributional patterns of its economy and society. Reference to them might have strengthened the geographical introductions to the various chapters. Again, such a work as the 'Atlas of Finland' would enable immediate understanding of the impact of winter icing in the inner Baltic—a primary physical fact ignored by the sections headed "Geography and Climate" and "Land and People" for Sweden and Finland respectively.

'The Scandinavian States and Finland' aims at an impartial statement of facts rather than an interpretation of them. Its character makes it an indigestible volume for general reading; but an indispensable one for the specialist. The abrupt end to the final chapter on Sweden makes one hanker after a few concluding remarks by the chairman to round off an informative book produced according to the exacting standards set by the Royal Institute of International Affairs. W. R. M.

WESTFALEN. By WILHELM MÜLLER-WILLE. *Münster: Aschendorffsche Verlagsbuchhandlung*, 1952. 8×5½ *inches;* 384 *pages; maps and diagrams. D.M.* 6.50

Professor Müller-Wille, head of the Geographical Institute at Münster University, is perhaps the person best qualified to describe the geography of that distinctive part of Germany, Westphalia. The present book is however more than an admirable regional geography: it is an interesting essay in the method of regional description. The work is surprisingly comprehensive, though it is a pity that the author does not bring it into the post-1945 period instead of leaving it at 1939. The book is divided into three main sections. The first places Westphalia in the broader background of north-west Europe, stressing the importance of its position in the communications pattern of this part of the continent. It is here that the author defines the Westphalia of the book, not

according to the boundaries as they have stood since 1815 but by reference to natural boundaries and to historical development. The second section treats extensively a detailed regional division. In this Professor Müller-Wille emphasizes the changes in the relationships between the different regions since the Middle Ages. It is this "dynamic" approach that makes the book of more than local interest. Finally, the third section is a consideration of the distribution of population and of economic geography over the last hundred years, particularly of the relations between agriculture and industry and the growth of cultural and economic centres (Zentralorte). It is in these last 125 pages that the author, working in his own special field, shows himself to be master of his task, and of what he terms "das Land Westfalen." Without doubt, Professor Müller-Wille proves his point that all the seemingly unconnected small regions (Landschaften) have been welded together under the hand of man into one clearly defined organism and that even if a few of these small regions were to break away (as some have indeed done) from the present administrative province the larger conception of "Land Westfalen" would remain, bound together by historical and geographical factors.

The limits of "Land Westfalen," as defined by the author, seem readily acceptable, except in the west—do they in fact agree so perfectly with the present political boundaries? Or is there a sound political argument for not transgressing what is today a "national frontier"? In the second section, the regional division seems to be a little excessive. The four main regions are certainly clear enough and the ones usually defined for Westphalia; but the twenty sub-regions appear in many cases to be made solely on minor details, particularly those of the Sauerland, and only tend to confuse the picture. Unfortunately there is no bibliography and no documentation, so that the reader is forced to accept statements at their face value. Although few people would seriously question the author's reliability, it would be a help to have a few references to points worth following up. Where did the statistics come from? And just where did Kohli make the statement attributed to him on page 232? A further improvement might have been made by placing some of the statistical information in tabular form rather than scattered liberally through the text. The forty-one maps and diagrams are presented in unusual form, though fuller keys and improved printing would increase their value (especially pp. 42 and 43). The charts and diagrams are good examples of the German gift of putting everything in its respective pigeon-hole (as on p. 173). The language is simple and direct, important for the English reader, though the more conservative geographer may not approve of some of the terms used. Professor Müller-Wille is nevertheless to be congratulated on producing this useful little book, bringing together much of his early research and presenting so many facts without overtaxing the reader. R. E. H. M.

ASIA

TURKISH DELIGHTS. By MARIE NOËLE KELLY. *London: Country Life*, 1951. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 172 pages; map and illustrations.* 18*s*

This book is a veritable Dolmabahche—a garden filled with the ancient glories of the land which is now Turkey. The writer visited a prodigious number of historic sites, getting as far afield as Erzurum where the houses "Nearly all have horizontal timbers to strengthen them against earthquakes" (p. 131) and as far south as Achana near Antioch, where "Professor Woolley says he found new data . . . for the history of the Mitanni, a mysterious power that played a role in the Middle East" (p. 99).

With her graceful pen Lady Kelly flicks back the present to disclose the treasures of antiquity of which, enabled by an artistically observant eye and retentive memory, she gives meticulous descriptions. About much of the book there clings a nostalgic stillness and into this she lures the ghosts of the past. The Empress Zia, pink and silly, whose portrait is in Santa Sophia, returns from banishment. "We want our Mothers," the Byzantine crowds had cried, and back she came with her old sister, the ex-recluse, to rule seated side by side on joint thrones.

"Black Eyes," the Turkish Punch, an endearing rogue, is the principal figure in the traditional shadow play (*Karagöz*) which is still shown; sets, made of camel skin, are now very rare. The last of the court shadow players, Nasif Bey, related the plays to Hans Ritter.

The book is well illustrated but a fuller map would have been helpful. The writer makes ample acknowledgment to the many authorities upon whom she has drawn. The attractive title is, perhaps, somewhat misleading since throughout the greater part of the book one misses the pulsing life of Turkey and, a little puzzled, asks "Where are the Turks?" A. B. C.

ARABIAN ADVENTURER: the story of Haji Williamson. By STANTON HOPE. *London: Robert Hale*, 1951. $8\frac{1}{2} \times 6$ *inches;* 335 *pages; illustrations.* 16*s*

This is the story of Haji Abdullah Williamson, an Englishman who lives as an Arab in a small village near Basra. Williamson was born in Bristol in 1872 and went to sea as an apprentice in a four-masted barque at the age of thirteen. He deserted his ship in California, worked for a while on a ranch, tried his luck in the gold-fields, and was shanghaied on board a whaling ship in San Francisco. He later traded in the South Seas but was arrested by the Spaniards and imprisoned under conditions of great hardship. Escaping, he made his way to Aden and there enlisted as a policeman, but was obliged to leave the force when he became a convert to Islam. In Basra he fell foul of the British Consul and the Turkish authorities, and left hurriedly for Kuwait in 1893. Williamson threw in his lot with the Arabs and lived among the townspeople of Kuwait, Zobair and Basra, or among the Badu with whom he travelled, raided and fought and whose horses he took to India for sale. He dwelt for a time among the Muntafiq shepherd tribes of southern Iraq and thrice performed the pilgrimage to Mecca and Medina. Later, buying a *dhow*, he engaged in gun running and the pearl fishery of the Persian Gulf. In the First World War he served in the British Intelligence Service and in 1925 he travelled in Oman with Dr. G. M. Lees. Few men indeed can have had so exciting, so varied and so interesting a life as this Haji Abdullah.

Mr. Stanton Hope collected the material for this book when he visited Williamson at his home near Basra in 1948; the present reviewer visited him at about the same time and is aware how formidable a task Mr. Hope undertook when he set out to sort and arrange the fascinating stories of an old man with a failing memory and no written records to help him. When he met him, he can have known but little of the Arab, and especially the Arab of the desert, yet Mr. Hope has written a book in which the descriptions of desert and seafaring life ring true. It is probably not his fault that the book is so slight; it is well worth reading as an adventure story based on fact. W. T

WHITE MAN RETURNS. By AGNES KEITH. *London: Michael Joseph*, 1952. $8 \times 5\frac{1}{4}$ *inches;* 320 *pages; illustrations.* 15*s*

There is little for the geographer in this moving little book, much for the student of human relationships. Those who read Mrs. Keith's 'Three came home'

will remember how she, her husband and two-year-old son, were interned by the Japanese in North Borneo during the war, and will not wonder at their resolving not to return to the east after their release. But the courage and idealism which carried the family through the ordeals of imprisonment took them back after all to Borneo, where Mr. Keith, as Conservator of Forests and Director of Agriculture before the war, was claimed as a key man in the work of reconstruction. In 'White man returns' Mrs. Keith tells the story of North Borneo's rehabilitation from the point of view of a wife, mother and highly individual woman. Being a good writer, her descriptions of the country are workmanlike and evocative, and the book includes a most interesting account of her husband's regular trips into the jungle, and his inspections of the great caves which house the birds' nests exported in large quantities for soup-making. But it is the people she really minds about, and the friends who helped the Keiths in captivity and welcomed them back are described with sympathy and insight; from their stories and characters Mrs. Keith builds up an attractive picture of a little-known corner of the British Commonwealth, worth taking into account in considering the future of Asia. D. M.

MOUNTAINS OF TARTARY. By ERIC SHIPTON. *London: Hodder and Stoughton*, 1951. 9×6 *inches; 224 pages; illustrations and end-paper maps.* 20*s*

CHINA TO CHITRAL. By H. W. TILMAN. *Cambridge: University Press*, 1951. 9½×6 *inches;* xi+124 *pages; maps and illustrations.* 25*s*

No journey of Mr. Shipton's is likely to be uninteresting, and his latest book, 'Mountains of Tartary,' shows that he did not waste his opportunities during his two terms as His Majesty's Consul-General in Kashgar. He describes with great charm a number of minor excursions made with Mrs. Shipton, and a few "set piece" attempts on some of the high summits on the western and northern fringes of Sinkiang—Bostan Terek, Mustagh Ala, Bogda Ola and Chakragil. In these climbs, or most of them, the true doctrine was observed; that a party composed of Shipton and Tilman and possibly one Sherpa is large enough and even verging on the cumbersome. And how well he does write! Action, description, reflection, all is interwoven with a straightforward ease and absence of pretentiousness rarely found in travel books. If he could have included some maps more worthy of the text, and persuaded his publishers to do better justice to his photographs, it would have been hard to fault this attractive book.

Mr. Tilman, too, might have been a little more generous with information in his maps. 'China to Chitral' covers much of the same ground and events as Shipton's book, in the idiom which Tilman has made his own. Once again opinion will be divided as to how much a good tale gains from so many scraps of wisdom from Dr. Johnson, P. G. Woodhouse, Mr. Pecksniff and Mr. Tilman. One is disarmed, for example, by "there is nothing so dangerous as a cook who meddles with foreign affairs"; yet the Tilman sense of human folly is so great that one begins to wonder how much good he sees in any of the people in whose countries he travels. Nevertheless, he made a fine journey and he tells the tale well. T. A. B.

AFRICA

LA MONTAGNE DU SINAÏ CENTRAL: étude morphologique. By HASSAN AWAD. *Cairo: Royal Geographical Society of Egypt*, 1951. 10×6½ *inches;* x+247 *pages; maps, diagrams and illustrations*

This is an altogether admirable monograph, of interest equally to geomorphologists and geologists. The first chapter presents an excellent up-to-date account of the geology. The other four chapters are devoted to a detailed

description by regions: western and eastern Sinai, the crystalline massif, the great escarpments of Tih and Egma. An annotated guide to previous literature (52 items listed) is given as an appendix.

The six folding black-and-white maps are works of art, of outstanding clarity, and they provide examples of an ingenious use of symbols to which much thought has been devoted. The 80 photographs include many folding panoramas. The whole work results from an ideal blend of geological and physiographical knowledge; it is efficiently organized but written with feeling and complete command of the French language.

From so much of interest it is difficult to pick out the high lights for notice. To the reviewer they are: 1. the discussion of the Nubian Sandstone and the map and photographs of the exhumed sub-Nubian peneplain (p. 83 and plate xxix); 2. the lacustrine deposits in the Wadi Es-Sheikh (p. 151–2); 3. the description of the great scarps of Tih and Egma and the discussion of their origin (p. 185); 4. the evidence on the nature and ages of the famous rift faults of the gulfs of Suez and Akaba.

The author is far from claiming to have solved all the problems. His monograph suggests many lines of inquiry which no doubt will be followed up in the future. One such is provided by the Nubian Sandstone: does it represent the feather edge of all three Mesozoic systems, developed farther north in fossiliferous marine facies, as the author implies, or is it only a facies of the overlapping Cretaceous, as would appear from Beadnell's account in 'The wilderness of Sinai' and from evidence in the Eastern Desert of Egypt (where it is all at least post-Middle Jurassic and in places definitely Cretaceous)? Another fascinating problem is presented by the lacustrine deposits, which extend intermittently for 30 kilometres along the Wadi Es-Sheikh. The author suggests that they were laid down in a series of lakes formed by blocking of the valley by cones of dejection from tributary valleys; but much more study and measurement are required. The terrace feature at the top of each occurrence needs to be levelled and fitted into a gradient diagram of the valley. If the occurrences turn out to be at various levels above wadi floor the author's hypothesis will be confirmed, but if they all fall into a continuous gradient, then, since it is highly improbable that all the lakes would have been dammed to the same level, some other explanation will be required. Meanwhile, the resemblance to the Sebilian silts and their mode of occurrence in the Nubian part of the Nile valley is most striking (plates xxxviii–xl). Further, despite the author's "local" explanation (p. 185), it is tempting to see in the slips and massive conglomerates of the Wadi Mureikha (plates lviii, lix) a relic of the Pontic pluvial period, like the Pliocene conglomeratic filling of the Nile valley in Upper Egypt.

Dr. Awad is to be congratulated. With this work he takes his place at once with the late Hassan Sadek Pasha as an Egyptian geologist and geographer of international status. W. J. A.

LA CÔTE D'IVOIRE DANS LA CITÉ AFRICAINE. By F. J. Amon d'Aby. *Paris: Editions Larose*, 1951. 10×6¼ *inches;* 206 *pages; map and illustrations.* 680 *fr.*

The Ivory Coast, with an area three-fifths that of France and more than three million inhabitants, is from many points of view the principal unit in the Federation of French West Africa. The Keeper of the Government Archives has made a general study of its history and its evolution as a French territory. His account is, for the most part, strictly factual—a long appendix, for example, quotes the terms of the chief treaties with the various native states; the interest of the book might indeed be greater were the author sometimes less objective

and more interpretative in his writing. His quest for objectivity does not however prevent M. Amon d'Aby from showing his great enthusiasm for the decisions of the Brazzaville Conference of 1944, since when the evolution of the territory has been directed, as he puts it, no longer by Europeans but by his fellow-countrymen, the colony's own inhabitants.

The book succeeds in striking a happy balance between past history and more recent events, especially those of the last fifteen years. The first section deals quite briefly with the first European contacts with the native peoples of the Ivory Coast; the next describes the French occupation and its administrative organization from the treaty of 1842 to the establishment of the Ivory Coast as an autonomous colony in 1893. The third and main section, of special interest to geographers, shows at some length the political, economic, social and cultural results of the French connection. Particular attention is given to the events of the Second World War and its consequences, and to the present organization of local government. Up-to-date information is given of the production of cocoa, coffee, bananas, oilseeds and timber, and the influence of road and railway construction and of port improvements, notably at Abidjan, is emphasized. The Government has encouraged the formation of agricultural syndicates and co-operative societies, provided credit, and expanded educational, medical and other social services, and in 1946 produced a comprehensive development plan. For British readers the interest of the book is increased by the many significant parallels and contrasts, in both the economic and political fields, with the neighbouring territory of the Gold Coast. R. W. S.

BLACK SUNRISE: Mulai Ismail, Sultan of Morocco. By WILFRED BLUNT. *London: Methuen*, 1951. 8½×6 *inches; 294 pages; maps and illustrations.* 21*s*

At the outset Mr. Blunt disarms any historian's criticism by emphasizing that 'Black sunrise' does not pretend to be a work of scholarship and research. The book is historically highly seasoned and fascinatingly readable. Mr. Blunt describes with rich contemporary documentation, in the period between the British Charles II and George II, the 55-year reign of a Sultan of Morocco whom Mr. Landau describes as "the greatest and most famous Alaouite Sultan, a man of indomitable character." This rather special kind of 'greatness' was certainly quite free from magnanimity. Indeed Sultan Ismail, ancestor of the present Sultan, could serve, in this sense, as an example of the equivocal dictum that "Great men are generally bad men." By mass-murder, this independent and nationalist monarch of the eighteenth century assured order. Uninhibited by scruples or benignity, he imposed upon Moroccans an iron and erratic discipline. Corrupted by power or perhaps only by heredity, he utterly lacked self-discipline which, for the mass of the people, is one of the preliminary safeguards of self-government. The Sultan's justice was the justice of a Tartaric Czar or of a still greater Sultan (Bayazid) who, in front of visiting French princes, commanded and watched the belly of one of his chamberlains cut open on a complaint against him for drinking the goat's milk of a poor woman. "But," observes Gibbon, "it was the justice of a Sultan who disdains to balance the weight of evidence or to measure the degree of guilt."

In summing up the subject of this rich and readable book, Mr. Blunt quotes the appreciation of no less, and no less experienced, an author than the liberal André Chénier, himself born in a Moslem capital and living in that same century. "Nero, Caligula and Helio-gabalus," observes Chénier, "were abhorrent villains, yet unequal to the fiend (Ismail) of whose acts I give but a partial relation. But, of all the monsters of history, it is to Ivan 'The Terrible' " (who murdered his own son with his own hands) "the bloody Russian despot of the sixteenth century, that he bears the most striking resemblance." T. P.

AMERICA

NUTTALL'S TRAVELS INTO THE OLD NORTHWEST. Edited by JEANNETTE E. GRAUSTEIN. (*Chronica Botanica*, Vol. 14, Nos. 1 and 2.) *Waltham, Mass.: Chronica Botanica Co.* (*London: William Dawson*), 1951. 10×7 *inches;* 88 *pages; maps and illustrations.* $3.00

Thomas Nuttall, F.L.S., was a native of Lancashire who made extensive botanical expeditions in the early nineteenth century. He travelled in north-western America, ranging the southern area of the Great Lakes and south to St. Louis and New Orleans. He also visited the head waters of the Missouri, then known only to the mountain men who dared the dangers of the wilderness and hostile Indians in their hunt for valuable furs. Nuttall made the journey described in this diary in 1810, as agent for Benjamin Smith Barton of Philadelphia, and was to be paid at the astonishing rate of eight dollars a month and expenses, for confronting the hardships and dangers of the frontier in search of botanical specimens and of Indian languages, customs and antiques. His personal interest did not rest there. Interspersed with the exhaustive descriptions of the plant ecology of the regions he traversed are observations upon the rich geology of the area between Pittsburgh and the southern shore of Lake Erie, a journey he made on foot though handicapped by constantly recurring fits of the ague to which he was subject.

When, about a week after leaving Philadelphia, he reached Pittsburgh he found it a town of 5000 inhabitants with a canopy of dense smoke caused by burning coal fuel. It was not till mid-June that he reached Cleveland after nearly three months' marching. He found it a tiny settlement; it had a population of seven in 1800 and was now only a little larger. Thence he went to Erie and returned along the shores of the lakes to Huron, apparently unable to secure passage in a boat. With his various diversionary trips to see the oil springs and other marvels, he must have walked some 400 miles from Pittsburgh to that place. An attempt to travel by boat down the Huron river to the lake failed because the river mouth was "beached up with sand by the wind"; but he got to Detroit at last. He found it a village of some 1500 people, and neatly laid out after a devastating fire; the inhabitants were mostly French and Roman Catholics. They suffered a good deal from goitre, a thing that Nuttall found it impossible to explain. From here he went to Michilimackinac on Lake Michigan and, crossing the lake, saw Winnebago Castle. How his journey ended is not at all clear, but he must have returned to Mackinac. He may have joined an expedition that travelled south along the Illinois river to St. Louis and so southwards to New Orleans, but he did not on this occasion succeed in reaching the Pawnee and Mandan villages on the upper Missouri.

The diary is mainly of interest to the botanist, but contains a good deal of information about the then natural geography of a great deal of country that has since been vastly changed by human intervention. The Indians attracted some of Nuttall's attention, but his notes on their society and way of living are scrappy and incomplete.

Nuttall was the author of 'An introduction to systematic and physiological botany' (1827); but his great contribution was 'The genera of North American plants,' the first volume of which was published in 1818. G. E. F.

A WEST-INDIA FORTUNE. By RICHARD PARES. *London: Longmans*, 1950. 9×6 *inches;* viii+374 *pages; maps and illustrations.* 21*s*

This is Professor Pares' third book on subjects of West Indian interest, and he describes in an engaging and forceful style "the history of a West Indian

sugar-plantation in the island of Nevis, and then that of a sugar-factor's business in Bristol." It is largely concerned with family history and the finances of the plantation and covers the general period 1685 to 1850, so that it reflects finally the first repercussions of the abolition of slavery.

The first part, "The Plantation," and especially Chapter 6 on plantation management, is of more direct geographical interest and touches also on some of the less tangible influences affecting migration from the British Isles in the late mid-seventeenth century. Part Two, "The Merchant House," is more purely financial but includes some practical evidence on the advantages and disadvantages of the port of Bristol as against London. Professor Pares calls successfully upon sources as contrasted as family portraits and State papers, and many general and crucial problems are discussed—as the lack of good communications, both between the islands and with England, especially in wartime (p. 151); the gulf between West Indian and English society (p. 163); and the exclusively materialistic attitude to slavery (pp. 132, 300). Intricate individual human reactions (chiefly to money matters) are the main preoccupation; environmental influences—the natural advantages of certain estates, the need for rotational planting, or the use of certain building materials—are to be gauged by inference or brief mention only. Yet a maze of finance and speculation does not obscure the fundamental seasonal rhythm of cropping times and shipping seasons partly conditioned by hurricane risks (p. 194) and, most pleasing to the regional geographer who carries his study to its logical conclusion, the ramifications of sugar can be traced from plantation life to the fields of international economics, strategy, finance and (seemingly to a less extent) humanitarianism. E. P.

PACIFIC

GEOGRAPHY OF THE PACIFIC. Edited by OTIS W. FREEMAN. *New York: John Wiley (London: Chapman and Hall)*, 1951. 9×6 *inches:* xii+573 *pages; maps, diagrams and illustrations.* £4

Thirteen American authors contribute to 'Geography of the Pacific' under the editorship of Otis W. Freeman. "A majority of these men," so runs the Preface, "were in the service of the United States during the Second World War in some capacity that dealt with the Pacific." "Many," it adds, "have recently completed concentrated research within the islands they describe." But the text rarely reflects the special knowledge of the several contributors; it savours of the compiler rather than the scholar. A wealth of detail has been collected but there has been little attempt to sift the facts or to understand the personality of the lands described. The dangers of over simplification, in a desire to be comprehensive within a limited space, are often apparent; and certain statements on territories of which the reviewer has first-hand knowledge makes her suspect the authoritativeness of doubtful statements in the other chapters. The task of producing such a work is enormous and Otis W. Freeman and his collaborators are to be congratulated on producing a compendium of facts and a useful bibliography (although this has several notable omissions) on certain of the Pacific lands. For the contents belie the title; the text deals essentially with the islands of the Pacific Ocean, excluding Japan but including Indonesia, New Zealand and the Philippines. Of the continents, Australia alone is included; the preface suggests that the other continental margins of the Pacific Ocean have been adequately treated elsewhere; but so has Australia, and in a far more scholarly manner than in this book.

The volume opens with three general chapters on the "Geographic setting

of the Pacific"; "the Native Peoples of the Pacific"; "the exploration and mapping of the Pacific." Then follow fifteen chapters on Australia and the many islands. The book offers nothing new in the way of material or viewpoint (but in all fairness to the contributors they do not claim that it does). Their aim is to make available to students in American universities and colleges the accumulation of material available in numerous works of reference. The standard of many of the maps is deplorable; some are taken straight out of official Year Books, while that on page 424 is outstanding for its numerous spelling errors and misplacements of towns. The statistics, too, are often out of date; there seems no reason to give 1939 population figures if, as in the case of New Zealand, later figures were available. The photographs are frequently poor and justice has not been done to the interesting and varied features of the Pacific landscape. This is an expensive volume and can hardly be said to justify the publishers' statement that it is "an authoritative, comprehensive book on the Pacific area." E. M. J. C.

PHYSICAL GEOGRAPHY

THE EARTH'S CRUST: a new approach to physical geography and geology. By L. DUDLEY STAMP. *London: Harrap*, 1951. 10×7½ *inches;* viii+120 *pages; maps, diagrams and illustrations.* 18*s*

In his preface Professor Stamp remarks that nearly everyone is interested in scenery, and that many desire to know its why and wherefore. He believes that to most people this desire remains unfulfilled because of the relationship of scenery to geology, *i.e.* to what is in the nature of things hidden beneath the surface of the earth and so to be visualized only by a scientifically trained imagination. To solve this "problem" he makes a "new approach" by calling to his aid a model-maker of amazing skill, and the outstanding feature of this book is its thirty-six coloured photographs (and a much larger number of half-tone "close-ups") of some two dozen models of selected areas, some real and some imaginary. We thus have the surface in natural colour and three dimensions, though in perspective, and the sub-surface structure depicted, where it is helpful, on the visible edges of the models. Professor Stamp asks for comments and constructive criticism on this new departure.

He has, with Mr. T. Bayley's skilful aid in making the models, produced a very attractive book which cannot fail to excite the interest of anyone into whose hands it comes. So far entirely good. But whoever finds his interest thus aroused and begins to read will find his progress made difficult by the arrangement of the book and his interest greatly damped by the character of the text. The book has in effect two texts; first, the extended captions, couched in explanatory terms and often of page length, which face the coloured plates; and second, the text proper which amounts to about thirty pages in all, distributed with its own text-figures and half-tone illustrations fairly indifferently through the 116 pages of the book. The text is arranged logically enough in four chapters and is presumably meant to be read connectedly, but its logic is destroyed in practice by the intercalated plates and explanations which not only interrupt but commonly anticipate it. Much of the text could in fact be dispensed with since its duty is discharged by the captions, and what remains could then have been made more valuable. As it stands it is too scrappy to appeal to an adult mind and too full of mere names and definitions to help the schoolboy.

It is to be hoped that in a future edition these defects may be made good. It is to be hoped also that the numerous errors and inaccuracies may be corrected. Some of them concern the plates; most are in the text and captions The errors

in the plates range from plain misrepresentations of fact, as in Plate 30 which shows the Chalk resting directly on Palaeozoic rocks under the London Basin, to interpretations which are merely unlikely, such as the wholly morainic threshold to the fiord in Plate 16. Those in the text are less frequently simple mis-statements than dubious or misleading statements. No reader can form an adequate idea of what is meant by the earth's "crust" when on page 1 crust is equated with lithosphere and in Figure 1 on page 2 the lithosphere is shown extending down 700 miles from the surface. Nor can he guess how a glacier erodes from the two statements—that blocks of rock falling on the glacier surface sink by regelation through the ice to the bottom (p. 33), "and by the process of *regelation* become frozen into the bottom layers. . . . They help the ice to scoop out hollows" (p. 42). In his endeavour to simplify, Professor Stamp takes liberties with our knowledge of what may be attributed to earthquakes or to the operation of frost-splitting, and attributes to the force of gravity the qualities of a process. Finally one may not omit mention of the "deliberate mistake" of Plate 4. There are few subjects respecting which this doubtful pedagogic device could be more out of place and which stand more in need of accurate and sincere representation. It is therefore the more unfortunate that the diagram inserted to explain this "mistake" introduces new confusion; it shows five successive rejuvenations each followed by a phase of aggradation exactly equal to the preceding rejuvenation. This degree of coincidence can only be described as incredible. D. L. L.

CRATÈRES EN FEU. By H. Tazieff. *Paris: Arthaud*, 1951. 8×6 *inches;* 249 *pages; maps, diagrams and illustrations.* 520 *fr.*

A vulcanologist who insists on being present at critical moments must often find himself in situations of acute embarrassment; Haroun Tazieff is moreover a rock climber of merit, and a connoisseur of the chiaroscuro of lava streams by night. The indulgence of all these tastes at the same time leads to some of the more sensational passages that punctuate a remarkably informative book about volcanoes. To quote the dust-cover, "Grâce à ses qualités sportives, il observe les phénomènes volcaniques . . . du plus près."

The greater part of the book deals with the volcanoes at the head of Lake Kivu in the Belgian Congo, whose eruption in 1948 the author had been assigned to investigate; hence, among other notable things, the predicament of finding himself between an advancing wall of lava and a well-nigh impenetrable wall of tropical vegetation. The account of these African volcanoes is itself punctuated by two chapters on vulcanism in general; a useful recapitulation of the subject which contains an unusually full account of the disastrous Martinique eruption of 1902 where, ironically, the local administration had minimized the danger of the situation because of the impending elections—the sole survivor in the town of St. Pierre was a prisoner in the jail. Modern views on the relation of vulcanicity to convection currents in the earth's interior are touched on, and the importance of the gaseous content of the magma to the dynamics of eruption is made clear.

The book concludes with chapters on Stromboli and Etna, where M. Tazieff was again in the thick of it, and appendices of explanatory notes and lists of active and dormant volcanoes. 'Cratères en feu' is the second volume in the series 'Exploration' by this publisher; the first, 'Terre arctique' by A. de Cayeux, told part of the story of Paul-Émile Victor's recent expedition in Greenland and displayed the same attractive interweaving of direct personal narrative with a lucid exposition of the scientific problem. Other titles in the series are in preparation. F. G.

MATHEMATICAL GEOGRAPHY

A HISTORY OF THE PRACTICE OF NAVIGATION. By J. B. Hewson. *Glasgow: Brown Son and Ferguson*, 1951. 10×7½ *inches;* viii+270 *pages; diagrams and illustrations.* 30*s*

Commander Hewson has written an informative and most readable history of the practice of navigation, which can be recommended to a much wider circle of readers than those who have a professional interest in ships and the sea. From the point of view of the layman it has two special merits: explanations of technical matters are lucidly given, and almost every page is rich with human interest, since the author quotes generously from the original writings of the men who were devising new techniques or feeling their way towards the solution of seemingly intractable problems of navigation. The average historian pays little attention to the history of technics, perhaps because the word carries the dreaded taint of usefulness, or worse still of materialism, which denies absolute freedom to the human spirit. Yet it is an inescapable fact that granted even the supreme loveliness of Helen's face, it could never have launched a thousand ships had not the techniques of ship-building and navigation reached a level in the Eastern Mediterranean which was far in advance of that found elsewhere.

It is in the Eastern Mediterranean cradle-land that Commander Hewson begins his story, reminding us that the Phoenicians, who fell heirs to the Cretans as a sea-power, guided their ships at night by the Lesser Bear. On the last page of his book we are still looking up at the sky, this time to understand the Position Lines of Marc St. Hilaire in 1875. In between these two points the arrangement is not chronological, but by topics. In Part I we have the apparatus of seamanship, the chart, the compass, navigational instruments; in Part II the actual practice—finding the latitude, determining compass variation, pricking the chart and so on. Finding the longitude, which baffled the seaman until towards the end of the eighteenth century, forms the concluding chapter. This method which carries us backwards and forwards in time with bewildering frequency, makes it difficult to form a general picture of navigational practice at particular dates—under Drake, say, as compared with Lord Anson or Captain Cook—and also involves some repetition, but it could hardly have been avoided. The diagrams are clear and simple and (with one or two exceptions) really illuminate the text. The attentive reader can soon grasp (for example) the principles of "Clearing the Distance," and need not be alarmed by the breezy way in which Commander Hewson goes on to say "the whole problem may be worked out by looking up ten logarithms" for only the sailor has actually to do that. We hear a great deal about Edmond Halley, as of course we should expect, about John Davis too, and John Robertson; but it is an even greater pleasure to meet the obscure Andrew Wakeley, of whom we know next to nothing except that he kept a shop on Rotherhithe wall, near the Cherry Garden Stairs, where he sold nautical instruments. Deciding to compute amplitude tables, and indeed a practically complete Nautical Almanack, Andrew "almost fainted" he says, when he realized the magnitude of his task; but he went through with it and put more than one generation of sailors in his debt as his book was again and again reprinted.

It is unfortunate that Commander Hewson has so often relied upon eighteenth and early nineteenth century authors for details of early history, since they are frequently unreliable. The old story about Martin Behaim, for example, is repeated. Edmund Gunter reappears mysteriously as Edward Weaver, Varenus (for Varenius) and Sanson are described as French mathematicians (the former

was Dutch) writing in 1694, when both had long been dead. These and other such slips are trifles perhaps, but more serious is the ascription to a Peter Adsiger of the letter of Peter Peregrinus written in A.D. 1269, and the statement that at this date an observation of compass variation was made. Quoting at second hand, Commander Hewson makes Peter say: "The exact quantity of this declination I have found, after numerous experiments, to be five degrees." There is no such passage in the well-known letter *De Magnete* of 1269. The reviewer must also object to the use throughout the book of "plane" chart and "plane" sailing, where the early writers used (and meant) the word "plain." The geometrical concept of "plane projection" was quite outside the range of the sixteenth or seventeenth century seaman, who took the common-sense view that if direction and distance were truly plotted the chart was true, whatever mathematicians might say. Ralph Handson (1614) who taught navigation, used the terms "ordinary" and "plain" chart indifferently (and incidentally the same holds good of the plain-table). Commander Hewson has assumed a state of mathematical learning and (more important) mathematical education, which in fact did not exist, as when he says "the writers of the sixteenth century did not avail themselves of the benefits of plane trigonometry." Handson's *Trigonometrie* (1614) was the first such work in English, he having made the translation at Richard Hakluyt's request. But it would be churlish to end on a note of criticism where a book is so freshly written, instructive and enjoyable. Rather we should pay the author the compliment of a practical test. In the latest volume of the Hakluyt Society (Vol. 99, 1951) there is a facsimile of Baptista Boazio's chart of Francis Drake's voyage to the sack of Cartegena and succour of Ralegh's colonists. His route on the face of it appears fantastic, but read with Commander Hewson's Chapter V it immediately becomes all plain sailing!

E. G. R. T.

GENERAL

PORTRAIT OF JANE: a life of Lady Franklin. By FRANCES J. WOODWARD. *London: Hodder and Stoughton*, 1951. 9×6 *inches;* 382 *pages; maps and illustrations.* 25*s*

This book about the wife of Sir John Franklin falls naturally into two divisions. The first is really autobiography—long extracts from the personal diary of Jane Griffin, covering her meeting and marriage with Sir John, and the period in Van Diemen's Land when he was Governor, and ending with his sailing in search of the North West Passage. The second is biography, an impressive picture of the tireless energy which Lady Franklin displayed in her attempts to rescue, or at least obtain information about, her husband's vanished expedition.

The impression left by both parts of the book is one of admiration for this most remarkable lady. She was beautiful, cultured, with a strong sense of social responsibility—a woman who was in the true sense charming, and at the same time knew her own mind. We get to know her—and to like her—very well indeed through the diary which she kept in great detail until she laid it aside to devote all her energies to goading the Admiralty into activity and in corresponding with sympathisers all over the world.

The author must be congratulated on this original, delightful and valuable aspect of one of the greatest Polar epics of all times, and of the personalities concerned with it.

J. M. S.

SOME RECENT TRAVEL BOOKS

Political hindrances to travel in many of the lesser known areas of the world now tend to limit the range in space of travel books, but there is no lack of

variety in the motives with which their authors have set out, or the style in which they have composed their narratives. Africa still provides an attraction for numerous travellers, among whom Laurens van der Post takes a high place ('Venture to the interior,' *Hogarth Press*, 12*s* 6*d*). The framework is a narrative of two journeys in Nyasaland, one to Mount Mlanje and another to the Nyika plateau, on an official mission. But the author was also seeking to adjust himself to the modern world after his wartime experiences, and to work Africa "out of his blood." These elements are skilfully combined, the personal aspect heightening the perceptiveness and response of the author to the contemporary scene. Less highly charged with emotion is Monica Krippner's record of her attempt to motor with a companion from Cape Town to Algiers ('African way,' *Bles*, 18*s*). Though they wisely submitted to defeat by the Sahara—the journey was completed by truck and petrol wagon—this is by no means the story of a failure. It is scarcely possible to form any fresh conclusions on African problems on such a journey, but the author's comments on scenes and peoples are illuminating and unhackneyed, and she does not allow the considerable difficulties encountered on the way to dominate her pages. T. J. Waldeck's book is of a different type; he was in Africa for a narrowly defined purpose, the taking of wild animals alive ("Treks across the veld,' *Museum Press*, 15*s*). The problem of securing each species is clearly presented, and the ingenuity with which it was overcome. Though rejoicing that the indiscriminate slaughter of game is now outmoded, the reader may wonder whether the fate of captured animals is in the long run more fortunate. The book is written in a somewhat pretentious style, which inflates the significance of the incidents described.

Mauritius, which has many links with Africa, has not received much attention recently. This gap is successfully filled by Maurice Malim ("The island of the swan,' *Longmans, Green*, 16*s*). His book will appeal to more sophisticated tastes than those already mentioned. He has an individual style, and can convey an atmosphere in a few sentences. The picture he gives of an older culture, mainly of French origin, in retreat before present-day economic and political forces, is extremely interesting, as is also his account of the island poet, Robert Edward Hart.

Central and South America are a close rival to the African continent as a theme for travel writers. One entertaining narrative is by Dana and Ginger Lamb, who in 'Quest for the lost city' (*Gollancz*, 16*s*) describe a search for a lost Mayan city in the wilds of Chiapas, on the Mexican–Guatamalan border. They are experts in travelling "the hard way," and their book is full of travel hints, which occasionally irresistably recall the Swiss Family Robinson. This is perhaps not a fair comment; they certainly displayed great ingenuity and determination, only to be robbed of the fruits of their labours by an unexpected stroke of fortune. Their lively narrative, full of well-drawn characters in unusual settings, and composed with more art than appears at first sight, has the great merit of retaining the reader's interest throughout. The last book, with a remoter Mayan background, is perhaps not strictly a work of travel. Miss M. Oakes, a trained ethnologist, spent a year in the isolated Guatamalan community of Todos Santos. In 'Beyond the windy place' (*Gollancz*, 18*s* 6*d*) she records in an engaging fashion the difficulties she encountered in winning the confidence of the people and obtaining an insight into their cultural ceremonies of considerable antiquity. She brings out well the importance of these in the lives of a people barely above the subsistence level and subject to the unchecked ravages of epidemics. Her story is told with sympathy and humanity, and not the least of its interest lies in the self portrait unconsciously drawn by the author. G. R. C.

THE SOCIETY'S NEWS

THE BRITISH HIMALAYAN EXPEDITION, 1952

This year's Himalayan Expedition, sponsored by the Himalayan Committee of the Society and the Alpine Club, left in March for Cho-Oyu, the 26,867-foot mountain about 18 miles west of Everest, to which reference is made in Mr. Shipton's paper. The Expedition, led by Eric Shipton, includes three New Zealand climbers, E. P. Hillary, H. E. Riddiford and W. G. Lowe; the first two were members of the successful 1951 Reconnaissance. Another member of the previous expedition is T. Bourdillon. Dr. R. C. Evans, A. Gregory, R. L. B. Colledge and Campbell Secord make up the party. Dr. L. G. C. Pugh, of the Medical Research Council, is attached to the Expedition to carry out physiological work in connection with problems of acclimatization; an attachment made possible by a generous grant of £600 from the Royal Society. The party will be equipped with an improved light-weight oxygen apparatus, produced in a remarkably short time through the strenuous efforts of Peter Lloyd and the School of Aviation Medicine at Farnborough. The whole of the oxygen equipment and cylinders were flown out to India from this country by the R.A.F.; a very considerable saving in time and cost made possible through the personal interest and help of our Trustee, the Chief of Air Staff, Marshal of the R.A.F. Sir John Slessor.

The Cho-Oyu Expedition plans to return in late July or early August and, if the Swiss Expedition does not succeed in conquering Everest meanwhile, to start immediate preparations for a British attempt on Everest next year for which formal permission has been received from the Nepalese Government. A telegram was sent by the Himalayan Committee to Dr. Wyss-Dunant, the Swiss leader, and his team, wishing them all success on the eve of their departure for Nepal in March.

THE SCIENTIFIC WORK OF THE NORWEGIAN–BRITISH–SWEDISH EXPEDITION

The recently returned Norwegian–British–Swedish Antarctic Expedition carried out meteorological, glaciological, geological and topographical work in the western part of Queen Maud Land. The meteorological work included a full two-year series of routine observations, including some 650 radio-sonde and "rawin" balloon ascents, which, together with data from bases of the Falkland Islands Dependencies Survey, the South African Weather Bureau, and whaling factories and other ships, provided the material for synoptic analyses of the weather of the Atlantic sector of the Southern Ocean. The location of the expedition base on shelf ice proved ideal for special studies such as a detailed measurement of the radiation balance, and wind-temperature gradients at various heights.

The glaciological work included the precise surveying of a grid of stakes over an area of 25 square kilometres on shelf ice, and at various places on the inland ice and mountain glaciers, to determine differential movement and net surface accumulation over periods of up to two years. Precise levelling along a profile 2·5 kilometres in length in 1950 and 1952 has indicated considerable constancy in the height above sea-level of the shelf ice, irrespective of the net surface accumulation. A pit 15 metres deep was dug in the shelf ice, and various boreholes penetrated to as much as 100 metres, providing continuous temperature

readings from various depths over periods of from six to eighteen months. Crystallographically undisturbed cores from these pits and boreholes provided measurements of density, porosity, permeability, grain size and orientation, and throw some light on the processes of transformation of snow to shelf ice.

During the summers, snow and *firn* profiles, together with detailed temperature measurements, were studied to depths of 12 metres at a large number of stations in the inland mountains and on the plateau to the south of them. Preliminary calculations suggest an average annual temperature of about −17° C. on the shelf ice and near the coast (agreeing closely with the yearly mean air temperature observed at Maudheim), and about −40° C. on a 2700-metre-high ice plateau at about lat. 74° S.

A determination of the thickness of shelf ice and inland ice was carried out by seismic sounding. This has given an interesting picture of the way in which the ice shelf is anchored on shoals or joined to the inland ice. A profile about 600 kilometres long from the coast, through a mountain range approximately 300 kilometres inland and on to an ice plateau to the south at a surface elevation of 2700 metres, has revealed ice depths of up to 2400 metres and an unexpectedly rugged underlying topography.

Geological investigations included the examination of all known mountains and major nunataks north of lat. 73° 50′ S. and between long. 02° E. and 12° W. The area examined is extensively underlain by a complex of metamorphic rocks, apparently part of a large stable block. This complex is unconformably overlain by a nearly flat-lying assemblage of clastic sediments, mainly of "continental" character with minor volcanic rocks, intimately invaded by large gabbro and diorite sills. Little is known about the age of these rocks.

A triangulation network, fixed by astronomical observations at its eastern, western and southern borders, has been run over the area of mountains and nunataks that was visited, and covers approximately 200,000 square kilometres. Stereoscopic photo-topography stations cover most of the area. Aerial photography has also been carried out over most of the area covered by the ground survey, and flights along the shelf ice and ice-covered coastal plain ranged from long. 3° E. to 18° W. The *Norsel* carried out a running survey along the coast, fixing the shelf ice edge by radar and obtaining a continuous "fathometer" track from long. 4° W. to 13° W.

Minor studies have included physiological investigations of the reaction of humans to polar climates, collections of lichens, fishes and other biological material, periodic precise measurements of the magnetic field, and auroral photography. E. F. R.

GRANTS TO EXPEDITIONS, 1952

The Council has approved the following grants. A Cambridge University expedition to Norway, to complete a three-year programme of study on the structure and movement of certain Jotunheim glaciers, £75. An expedition from Bedford College, London, to investigate the shore-line curves of islands in Myvatn lake in Iceland and outflow channels in the neighbourhood, £40. To Miss M. C. Findlay, to complete her research on sheep farming in Greenland, £50. The Durham University Exploration Society's expedition to French Morocco, to study the frontier region of the Roman province of Mauretania Tingitania and the ecology of the Tichchoukt massif, £75 (of this sum, £30 is derived from the Stephens Bequest for botanical geography). The Durham University Exploration Society's expedition to Iceland for glaciological research and survey on Esjufjoll, £40. The Oxford University Exploration Club's expedition to Terhi-Garhwal to study social economy, settlement and land use

in high Himalayan valleys, £100. The Oxford Exploration Club's expedition to Turkey to study the human geography of part of the vilayet of Tunceli, £150 (subject to Turkish permission being received for work in the area selected).

THE SOCIETY'S NEW SURVEYING INSTRUMENTS

The Society's lightweight Kern theodolite [1] and Zeiss photo-theodolite have both been in use in South Georgia this year, the Kern being on loan for the first time since its purchase in Switzerland. Owing to the absence of the South Georgia expedition from October to April, these special mountain instruments were not available when Mr. Shipton left for Nepal, nor could similar new ones be bought in the time available. A happy solution was reached when Messrs. Hilger and Watts offered to adapt and lend to the Society any one of their own theodolites. After consultation with Colonel D. R. Crone and Mr. A. Stephenson, the firm's designers accomplished a very rapid and fine piece of work, and Mr. Shipton left the country with a new Watts No. 1 Micrometer Theodolite on which an Ilford Advocate camera, suitably calibrated to the instrument, had been accurately mounted.

THE PRESENTATION OF THE VICTORIA MEDAL TO PROFESSOR COTTON

In 1951 the Society's Victoria Medal was awarded to Dr. C. A. Cotton, Professor of Geology in the Victoria University College, New Zealand, in recognition of his distinguished contributions to geomorphology. At the Society's Annual General Meeting, the medal was received on his behalf by the High Commissioner for New Zealand; the presentation to the recipient was made later, at a special gathering of the Wellington branch of the New Zealand Geographical Society, by the Hon. C. M. Bowden, M.P., Associate Minister of Finance. Professor Cotton then delivered a lecture based on his paper "Accidents and interruptions in the cycle of marine erosion," recently published in the *Journal*. Professor K. C. Edwards (of the University of Nottingham and at that time acting head of the Department of Geography at Auckland) conveyed to Professor Cotton the congratulations and good wishes of geographers in Great Britain.

PHOTOGRAPHIC COPYING FROM THE *JOURNAL*

The Royal Geographical Society is a signatory to the Fair Copying Declaration of the Royal Society which provides for the use, without infringement of copyright, of photographic reproductions of the text of scientific journals. Details of the declaration may be obtained from the office of the Royal Society. Briefly, it permits a library or museum to issue a single reproduction from such a journal to a person who requires it solely for private study or research, and who undertakes not to sell or reproduce the copy supplied.

A BRITISH CARTOGRAPHICAL EXHIBIT

At the request of the National Committee for Geography, the Society has undertaken to organize the British Cartographical Exhibit for the International Geographical Congress in Washington in August. The contributing Departments have been the Ordnance Survey, Directorate of Military Surveys, Directorate of Colonial Surveys, the Ministry of Housing and Local Government, and the Air Ministry. One section will show examples of the cartographic work of the Society and the Exhibit will include geographical periodicals as well as a selection of atlases published by commercial organizations. The

[1] See *Geogr. J.* 115 (1950) 258.

Exhibit has been planned on a panel space of 135 square metres, with 7 square metres of table space. This provides for 130 map sheets and 42 periodicals and other publications. As planned, the Exhibit will be the most comprehensive British cartographic display so far organized. On conclusion of the Congress, the whole Exhibit will be presented by the National Committee to the U.S. National Research Council for disposal.

THE RECORD

CONTRIBUTORS TO THIS ISSUE OF THE *JOURNAL*

Eric Shipton is a distinguished mountaineer and traveller who needs little introduction to readers of the *Journal*; he was awarded the Society's Gill Memorial in 1935 and the Patron's Medal in 1938. A note on the expedition in which he is at present engaged will be found at page 230. *Richard Goodchild*, Librarian of the British School at Rome, is an archaeologist who has carried out a series of surveys of the Roman frontier zone in Libya where he was at one time Antiquities Officer with the British Military Administration; his studies in Tripolitania were the subject of an earlier paper read to the Society. *J. K. Wright* is a former Director of the American Geographical Society, which celebrates its centenary this year. *A. A. Grigoriev*, a distinguished member of the U.S.S.R. Academy of Sciences and a medallist of the Russian Geographical Society, is Director of the Geographical Institute of the Academy and of the Geology and Geography Section of the Society for Dissemination of Political and Social Knowledge. Professor *J. A. Steers* is Professor of Geography at Cambridge and has made a special study of the geomorphology of coastlines. *M. Aurousseau* is Secretary of the Permanent Committee on Geographical Names for British Official Use, which has its headquarters in the Society's House. Professor *C. A. Cotton* has recently contributed several geomorphological papers and reviews to the *Journal*. Professor *J. Roglić* is Professor of Geography in the University of Zagreb. Professor *G. H. J. Daysh* is Professor of Geography at King's College in the University of Durham.

THE METEOROLOGY OF THE ANTARCTIC

A recent paper on "Antarctic atmospheric circulation" [1] by Arnold Court provides, within the compass of twenty pages, a new and timely survey of our knowledge and understanding of Antarctic meteorology. His summary on the theoretical side will be particularly valuable to all who embark upon Antarctic problems; it errs perhaps a little here and there at the expense of clarity in its fullness and almost excessive fairness to conflicting view points. The student who needs detailed facts and figures will surely find what he needs in the bibliography of 140 items with generalized lists of further sources. This bibliography is unusually well balanced in its awareness of American, British, Scandinavian, German and South American sources; but one wonders if the single Russian entry relating to the whaling voyage of 1947–48 really represents the Soviet Union's most serious contribution to Antarctic meteorology. One or two other items seem of too slight importance to have deserved inclusion. Over

[1] Arnold Court, "Antarctic atmospheric circulation," in the *Compendium of Meteorology* published by the American Meteorological Society, 1951.

half the sources listed appeared in the last ten years—a tribute to what science sometimes gains from international political rivalry.

Our knowledge is still only fragmentary, though it has reached the point where we can rule out Hobb's theory of the permanent glacial anticyclone. There is great need of more data, geographical as well as meteorological, from the interior of Antarctica which (as Court reminds us) still contains the largest unexplored area in the world. We are still in the stage where meteorological evidence may be used as a clue to the unknown geographical features of the Continent. The day will come when these features are known and we are left still puzzling over their more intricate effects upon the atmospheric circulation, amongst which may well be the various hints already detected of curious and often anomalous diurnal variations of wind and temperature at certain times and places. Hasty photographic reconnaissances of the unexplored territory by air would be no substitute for thorough-going survey parties working on the ground, accompanied by suitably equipped meteorologists to make weather and ice observations and interpret them. Court remarks that the technique of several expeditions of more recent years has resulted in less comprehensive surface data than were brought back by earlier explorers. We need further endeavour along the lines of the 1949–52 Norwegian–British–Swedish expedition, particularly directed towards the "pole of inaccessibility" in the region around 80° S. 80° E.

Mr. Court was himself meteorologist on Admiral Byrd's expedition of 1939–41 to Little America at the head of the Ross Sea, where he made the first radio-sonde ascents. From this material he was able to show for the first time that in the long polar winter-night the stratosphere becomes cold. This result has since been paralleled in the Arctic too. The warmth of the Antarctic stratosphere in summer has been found to exceed that occurring in the northern hemisphere; it implies prevailing easterly winds in summer in the upper stratosphere over the south polar regions as well as in the bottom layers. The spring warming is seen first in the upper stratosphere and proceeds downwards as the sun's rays return to the lower levels.

The broad pattern of these seasonal changes of temperature and corresponding winds in the polar stratosphere, described by Court, is similar to that in the northern hemisphere. Scherhag has discovered a 30·5 day oscillation in the winter westerlies (circumpolar vortex) in the northern stratosphere, apparently setting in about the time that the sun's rays are cut off from the ozone layer over the polar regions in October and associated with the more or less monthly recurrence of anticyclonic and cyclonic periods during most winters in Europe (singularities). Can it be that this oscillation is a counterpart to Simpson's monthly (30 day) pressure surges in Antarctica? If so, a tendency may be discovered for colder and milder, respectively quiet and stormy periods to recur about certain dates of the year in Antarctica. We lack the necessary long records from any single place to establish such a tendency, though Court's own data might be held to suggest it in the Ross Sea (coldest periods in early May, July and September).

Quite apart from the newer observational material, the interest of theoreticians in Antarctic meteorology has received a great impetus in recent years from the global view point promoted at various meteorological research institutes, particularly by Professor Rossby. Daily synoptic weather maps of the southern hemisphere as a whole have thrown valuable light on the evolution of the weather situations over the polar regions and their association with the atmospheric circulation over other latitudes. The most striking point which emerges is the much greater variability of the atmospheric circulation over

Antarctica than had been supposed. Maps of average conditions, however much they are refined by additional data, may be no guide to the circulation pattern on any particular day or even to the range of types of pattern which can occur. Court remarks on the various sizes and forms and shifts of position which the south polar anticyclone undergoes, he might also have added that it is often non-existent. North-westerly surface winds have occasionally been observed in the belt of prevailing easterlies, even high up on the ice-cap near the magnetic pole; this is a sector where there is some evidence for depressions rather commonly mounting the ice-cap. Snowfall, at least in small quantities and associated with frontal or cyclonic situations, is believed to reach occasionally to all parts of the interior. The occurrence from time to time of such anomalous weather situations must in future be taken into account, both in seeking to explain the form of the ice-cap and in planning expeditions over it. Not only day-to-day but also year-to-year variations are important; for Court makes it clear that 1912 was the windiest year of which we have extensive observational record in Antarctica, a fact which probably cost the lives of Scott and his party.

Whoever solves the riddle of the interior of Antarctica and checks the guesses of meteorologists and glaciologists as to the height and position of the ice-cap crest must remember, before he sets out, that the ice-cap anticyclone shown by the climatic mean maps may only be dominant at certain times and more often in some years than others; often it can only be represented by a space of quiet weather between neighbouring depressions, whilst certain parts (at least) of the ice-cap are known to be invaded from time to time by depressions and cyclonic weather. Snowfall and strong winds certainly become less frequent in the interior, but probably nowhere in Antarctica is entirely immune.

H. H. LAMB

CONTOURS ON TOPOGRAPHICAL MAPS

The contours on the 6-inch Ordnance Survey sheets are of an unusual standard of accuracy having been pegged out on the ground with a level; but the process was an expensive one and these accurate contours are, for the scale of the map, generally too far apart to give a good visual impression of the relief. It is more usual for the contours on topographical maps to be less precise and much closer together, and this change was recommended in general terms by the Davidson Committee on the Ordnance Survey in 1935.

Brigadier H. A. L. Shewell of the Ordnance Survey has recently made an instructive examination of the degree of accuracy which is appropriate in the contours on topographical maps, and of the errors which arise in their interpretation ("Accuracy of contours," *J. Roy. Inst. Chartered Surveyors*, 31 (1951) 195–215). He points out that, in the first place, minor irregularities such as furrows must render the surface level indeterminate within about a foot, and that the accuracy with which a contour can be laid down on the map depends on its scale, however precise the field work may be. His first and most important test is of the accuracy with which the height of points selected at random can be interpolated from the adjacent contours when these are known to be accurate A set of 52 points was marked on a 6-inch map with 100-foot contours, and five people with varying survey experience estimated their heights. The errors appeared to be normally distributed and the standard error was 18·2 feet.

Where however the map contours are not accurate, the error of estimation will reflect that factor as well, and since the errors in adjacent contours are likely to be rather highly correlated to each other, the mathematical treatment of the total error of estimation is somewhat complicated. Brigadier Shewell

concludes that the error of estimation in the heights of random points will not be doubled unless the standard error of the contours exceeds three-tenths of the contour interval. One-fifth of the contour interval (which leads to a 50 per cent. increase over the error of estimation with perfect contours) is suggested as a suitable standard which can be realized with fairly rapid and simple methods of air survey. A sheet of the 6-inch map was prepared with its contours displaced to this extent and the standard error of the estimates of the same five observers was 20·8 feet (rather less than expected). Since the total error of estimation depends both on the contour interval and the error of the contours, the most accurate estimates will result from close contours of an appropriate degree of accuracy and no more. Another consideration is that small features must always tend to slip between wide contours, so that close contours rather than precise ones are needed for their representation.

In the discussion on the paper (*op. cit.*, pp. 429–33), its applicability to modern methods of air survey was questioned on two points. A limit to the accuracy of the contours is set by the flying height and the distortions of the lens, these factors had not been considered in the paper and more accurate contours were now attainable than had been implied. Secondly, the correlation between the errors of adjacent contours would be less with the accurate contours that are traced singly across the map in plotting machines. It was also questioned whether the experiments with 100-foot contours on a 6-inch map were of wider application. We are however informed by Brigadier Shewell that a later experiment with accurate 25-foot contours on a 1 : 25,000 map gave an error of estimation of 4·2 feet; this is 16·8 per cent. of the contour interval, in surprisingly close agreement with the first experiment. F. G.

A FRENCH EXPEDITION TO THE RED SEA

We have received a preliminary account of the expedition under M. Cousteau which sailed from Toulon in November 1951 in the yacht *Calypso* for a two months' scientific cruise in the Red Sea. A camp was established on Abu Latt, at the north of the Farsan bank. The expedition included biologists, physical chemists and the two geologists, Tazieff and Nesteroff. Diving apparatus was used for zoological collection to a depth of over 100 fathoms. The *Calypso* carried out continuous soundings among the coral reefs of the archipelago, where the many dangers to navigation preclude the use of larger vessels, and under Tazieff's supervision six cross-sections of the bed of the Red Sea were also obtained. They should add considerably to our knowledge of this remarkable submarine rift valley.

AITOFF'S PROJECTION OF THE SPHERE

It would appear that the equal-area projection generally known as Aitoff's should be attributed to the geodesist Ernst Hammer. It will be seen from K. Wagner's recently published 'Kartographische Netzentwürfe"[1] that Aitoff's projection, as used in the 1888 edition of Schrader's atlas, was one derived from the zenithal equidistant projection by doubling the x coordinates and that it was therefore not itself an equal-area projection. Hammer applied Aitoff's method to the transformation of the zenithal equal-area projection and so produced the form now in general use, which he published in 1892.[2]

It is clear that this method of transformation, by doubling one set of coordinates, is applicable to any projection of the hemisphere though the result may

[1] Briefly reviewed in the *Journal* 117 (1951) 238.

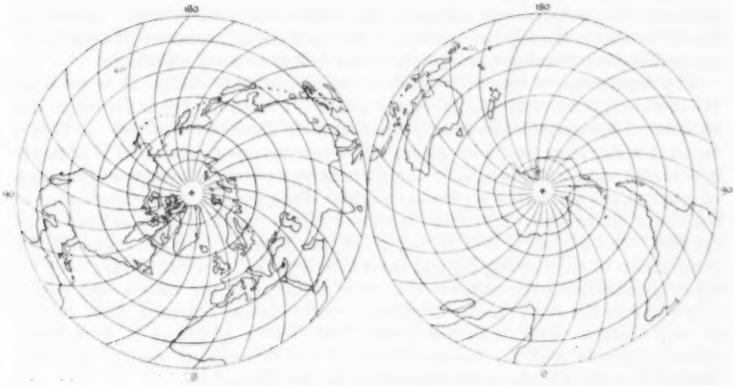
[2] E. Hammer, "Über die Planisphäre von Aitow und verwandte Entwürfe, insbe sondere neue flächentreue ähnlicher Art," *Petermanns Mitteilungen*, 28 (1892) 85–7.

seldom be of value. A comparison of Aitoff's and Hammer's nets shows that the strict equivalence of the latter introduces an increased angular distortion at the eastern and western margins. H. J. A.

A FORGOTTEN PSEUDO-ZENITHAL PROJECTION

An interesting equal-area projection in which distances measured along the meridians are true to scale is described in Herz's 'Lehrbuch der Landkartenprojektionen' (Leipzig, 1885), p. 189, where it is attributed to Wiechel.

This is an equal-area projection with circular quadrants as meridians and the construction is as follows. If r is the radius of the earth (assumed to be spherical), draw a circle of radius $r\sqrt{2}$; this will be the boundary of the projection of one hemisphere, that is, the Equator. Now draw any diameter on it and take a point distant from the centre by a length equal to r. Use this new point as a centre and with radius r describe a quadrant of a circle, starting from



the original centre and ending at the boundary. This quadrant will represent a meridian. Similar quadrants, equally spaced, will represent the other meridians.

The parallels are concentric circles passing through points measured along the curve of the meridians at correct distances from the equator.

We may, if we like, look upon each meridian on this projection as the true world-meridian turned round so as to lie flat on the paper, preserving its curvature. It is easy to prove that the projection is equivalent (equal-area); the parallels are in fact the same as on the well-known zenithal equal-area projection. While areas are preserved, and distances along the curves of the meridians are true to scale, angles and other distances are sacrificed and, as must happen with all equivalent projections, there is a considerable distortion of shape away from the centre. The projection can evidently be extended to the whole sphere, as it was by Wiechel, but the distortion of the remoter hemisphere is excessive.

C. F. A-C., F. G.

THE *BULLETIN* OF THE OXFORD UNIVERSITY EXPLORATION CLUB

When the Oxford University Exploration Club resumed its activities after the interruption of the War, it also began the publication of a *Bulletin* containing summaries of the expeditions undertaken. Four numbers have appeared since 1948. These summaries have in many instances contained useful information

on the organization and equipment of the expeditions and with *No. 4* (1951) the Club has embarked on a deliberate policy of presenting this information in a form directly useful to future travellers, particularly in regions less well catered for than the Arctic. There are, for example, analyses of the expeditions' accounts and a short paper on the natural and official obstacles to motor transport in North and Central Africa. Other special articles are promised for *No. 5*, which is to appear in September 1952.

METEOROLOGY AND INSURANCE

An interesting recent development has been the emergence of the profession of consultant meteorologist and climatologist. Of unquestioned importance in wartime operations, weather is now an acknowledged and measurable factor in many peace-time occupations and considerable advances have been made in harnessing weather science, imperfect as it often is, to the service of industry and agriculture. Its applications to the specific problems posed by the film producer, the construction engineer, the architect and the planner, as well as the farmer, have already been achieved, with a gratifying measure of success, by meteorological consultant groups operating in America and elsewhere.

The application of weather science to the insurance business has as yet been but little explored and M. C. Hart's paper "Tropical revolving storms and windstorm insurance" (*Journal of the Chartered Insurance Institute*, 48 (1951) 89–143) is therefore useful in opening up a new avenue of research. The paper is readable and combines a fairly comprehensive survey of the facts and theories of tropical storms with a somewhat slighter discussion of their significance in the insurance market. The study is indeed purely tentative and, as the author realizes, "the gathering and sifting of all the necessary details demands the cooperation of meteorological and insurance experts." Indeed it falls very far short of exhausting the subject and, while recognizing the value of the paper, it is a matter for regret that this pioneer study should not have been written in collaboration with a meteorologist. Mr. Hart's language is sufficiently technical not to hurt the susceptibilities of the technicians, and at the same time sufficiently simple to be understood by the lay reader.

E. M. F.

THE INTERNATIONAL CENTRE OF ONOMASTICS

The Third International Congress of Toponymy and Anthroponymy was briefly reported in the *Journal* (114 (1949) 226). The complete success of the Congress as regards its principal effort is expressed by the publication of its Programme, Proceedings and Transactions, in three volumes, by the International Centre of Onomastics, now firmly established at Louvain. The plans for the foundation of such a centre were developed and approved by the Third Congress, and their execution was made possible by U.N.E.S.C.O. Both U.N.E.S.C.O. and the Belgian Government have contributed towards the cost of publishing the work of the Congress. Volumes 2 and 3 contain a variety of papers on many aspects of name-study. Of particular interest to British geographers are: "The surveys of English place-names," by A. H. Smith; "Comparative place-name study," by E. Ekwall; "Soil-survey and place-name study," by C. H. Edelman; "L'Origine du nom de *Londres*," by G. Alessio; "Official standardization of geographic names in the United States," by M. F. Burrill; "Some problems in regard to the forms of South African place-names," by G. P. Lestrade; and "The recording of African place-names." by J. Berry. Those interested in the work may consult the volumes at the office of the P.C.G.N., which is on the second floor of the Society's House. The International Centre of Onomastics has also founded a journal, *Onoma*, devoted

mainly to information and bibliography. The first issue appeared in 1950. The office of the Centre is at the Instituut voor Naamkunde, E. van Evenstraat 10, Louvain, Belgium. The Director is Professor H. J. van de Wijer, who was joint President, with Dr. J. Herbillon, of the Organizing Committee of the Third International Congress of Toponymy and Anthroponymy in 1949. M.A.

RELIEF MODELS OF COMMONWEALTH TERRITORIES

A number of new relief models have been added to the collection at the Imperial Institute. The most interesting and unusual are perhaps the large-scale models of small islands and territories, which in a school atlas generally appear as no more than a dot with the name underlined in red. Here Trinidad is on the scale of $\frac{1}{2}$ inch, Mauritius 1 inch, and Malta 2 inches to the mile; while the model of Gibraltar, on a scale of 16 inches to the mile, emphasizes the minuteness of the territory as well as showing a wealth of detail.

Larger territories of which relief models, necessarily on a smaller scale, have recently been made for the Institute include Pakistan, British Guiana and the Anglo-Egyptian Sudan. For Pakistan there are separate models to show the distributions of rainfall and irrigation, geology and minerals, and communications and land use. These models produce the curious effect of a territory bounded on several sides by steep cliffs, for the relief is not carried beyond the frontier line.

SOUNDINGS IN BALA LAKE

Through the courtesy of Professor Pumphrey, F.R.S., of Liverpool University we have now had an opportunity of making a detailed comparison between the results of the survey, by echo-sounder, of Bala Lake carried out by his Department in October 1951, and those obtained by Miss Ferrar in May and August 1951 with a lead and line.[1] The two maps are very nearly identical, but the closer network of the later survey reveals a maximum depth of just over 140 feet (as compared with 136) immediately south of Miss Ferrar's second deepest sounding of 135 feet. It is not possible to say whether the lake level from which depths were measured was exactly the same in both surveys, but it cannot have differed by more than a foot or so.

Considering the well-known difficulty of obtaining good results in shallow water with an echo-sounder, the amount of detail at the two ends of the lake is remarkable and agrees closely with Miss Ferrar's soundings. The shoal off the Llafar delta does not however show up so well.

THE FIRST ASCENT OF TIRICH MIR

In the account of the first ascent of Tirich Mir in the last issue of the *Journal* (p. 102), it was wrongly stated that the summit was reached in June. The first ascent was on 21 July 1950 and the summit was again visited on the following day.

LE PLAY SOCIETY SUMMER EXCURSIONS

This summer the Le Play Society will organize geographical excursions to Schleswig-Holstein and Dordogne, and one to County Antrim which is timed to precede the meeting of the British Association in Belfast. The University Student Group of the Society will meet in Belgium. For further particulars of these meetings, application should be made without delay to the Director, Miss Margaret Tatton, The Birlings, Birling Gap, Eastbourne.

[1] *Geogr. J.* 118 (1952) 60–63.

OBITUARY

COLONEL PERCY KENNETH BOULNOIS, O.B.E., M.C.

To his many friends, especially to those who had seen him only a few days before, radiating his usual vitality and cheerfulness, it came as a great shock to hear that "P.K." had passed away suddenly at his home at Hurlingham Court on 8 February 1952.

P. K. Boulnois was born at Southsea on 12 February 1889. In 1903 he went to Wellington College, where he had a brilliant career, winning the Wellesley Exhibition and passing top into the R.M.A. Woolwich. In 1907 he was commissioned into the Corps of Royal Engineers. His love of horses led him to apply for a Field Company at the conclusion of the usual Chatham Courses, and he was duly posted to the 57th Company at Bulford, where he was able to supplement the more formal military training by hunting regularly. He saw service with his company in the opening campaign of the First World War, from Mons to the first Battle of Ypres.

He was invalided home and, on leaving hospital in August 1915, went to the R.M.A. Woolwich as Instructor and Company Commander. This appointment was one which would normally have been entirely after his own heart, for throughout his life he had a special sympathy with the young; but he was anxious to get back to active service. This he achieved in June 1917, when he was appointed to command the 54th Field Company in Italy. He was awarded the M.C. and mentioned in despatches for his conduct during the operation of bridging the Piave in October 1918.

After the War he took up survey work as a specialist and, after a special course at Chatham, served on the German–Polish and Danzig Boundary Commission and was subsequently head of the Danzig Free State and Corridor Commission. He then went to Africa for the delimitation of the frontier between French Equatorial Africa and the Anglo-Egyptian Sudan. He was in charge of the British Commission during the later stages of the work. This Commission was notable from the survey point of view as being one of the first on which wireless was used for the determination of longitude. Boulnois made a valuable contribution to the early development of the practical side of this process and read a paper to the Society on the subject in 1924. He was awarded the O.B.E.(Mil.) for his work on this commission.

On his return from Africa he joined the Geographical Section General Staff at the War Office and, as Liaison Officer with the Air Ministry, was responsible for much of the early work in developing air charts. It was particularly at this time that he was able to indulge in his fondness for travel, using his leaves to visit many of the less known parts of Europe. In 1927 he went to Chatham as Chief Instructor in Survey. This appointment was greatly to his taste as it gave him an opportunity of meeting and training young officers at the start of their military careers. His infectious enthusiasm made many a young officer resolve to take up survey as his life's work. His love of horses again became apparent and he was one of the founders of the R.E. Drag with which he hunted regularly.

In 1935 he took over charge of the Geographical Section General Staff, later known as the Directorate of Military Survey. In this post he was responsible for the preparation of the mapping which would be required if war, whose shadow was beginning to menace the country, broke out; he also began the reorganization of the R.E. Survey Service, thus laying the foundations for the

very large development of military survey which occurred during the War. During this period he took a keen interest in the work of the Society and was a Member of Council for several years.

In 1941 he became Deputy Director Prisoners of War and later joined the Petroleum Warfare Department, being sent to South Africa and, subsequently, to Washington with the Geoffrey Lloyd Mission. In August 1943, after joining the Civil Affairs Staff Centre, he became Military Governor of Sardinia.

He was the first post-War Chairman of the Field Survey Association and it was largely due to his energy that the Association was able to get off to a flying start after the War. After his retirement from the Army he became Chairman and Managing Director of the St. Bride's Press, Ltd., proprietors of "The Surveyor and Municipal and County Engineer." He was particularly glad to take over this post as his father, the late H. Percy Boulnois, had held the same post in the paper's early days.

In addition to his interest in everything to do with horses he was a keen oarsman, rowing for the Royal Engineers at Henley in 1910 and 1911 and being a member of Leander.

In 1921 he married, at Khartoum, Violet Vansittart, daughter of the late Lieut.-Colonel C. W. Long, R.H.A., who survives him with a son and daughter.

G. C.

CORRESPONDENCE

THE FUNG KINGDOM OF SENNAR

In a review of Mr. O. G. S. Crawford's 'The Fung Kingdom of Sennar' which you published in the March issue of the *Journal* under the title "The Muslim Sudan in the making," I rashly threw doubt on the existence of the Makaberab tribe on the ground that the name is not listed in Sir Harold MacMichael's authoritative 'History of the Arabs in the Sudan.' I now find that Naum Shoucair, the author of the well-known (Arabic) history of the Sudan, mentions the Makaberab "notorious for brigandage" as a sept of the Ga'liyyin.

S. HILLELSON

3 *April* 1952.

GREEN SKY AROUND DUSK

In the March issue of the *Journal* the reviewer of ' The weather,' by G. H. T. Kimble, describes rifts of greenish sky as being quite often seen during stormy Atlantic types of winter weather. Observations in Pembrokeshire and south-west England in successive winters of the war years suggest that this phenomenon occurs up to a maximum of about half a dozen times per winter in the south-western quadrant of the British Isles. The majority of these occurrences appeared to be associated with one or the other of two synoptic situations.

The first situation implied an extensive low-pressure area with a slow moving occluded depression or a number of separate centres in the sea area between southern Greenland, Iceland, western Norway and north Scotland. South and south-eastward of this a fresh to strong south-westerly air-stream over the British Isles is determined by the displacement of the main anticyclonic area

to central Europe. Such a background normally gives rise to exceptionally stormy and unsettled conditions with a series of secondary depressions (individual members may record pressure as low as 960 to 970 millibars) moving rapidly north-eastward from north of the Azores and eventually passing up the Irish Sea or along the west coast of Eire. Ridge conditions in the rear of individual secondaries are very short-lived, there being little veer of wind at the clearing cold front or cold occlusion. When such clearances coincide with the mid-afternoon period there is little development of cumulus cloud in the coastal areas of south-west Wales and south-west England so that the dusk period is marked by clear skies which may show a greenish hue. This invariably proved to be a bad-weather omen in that it preceded the commencement of pre-frontal rain by, on average, some 12 to 15 hours.

The second situation is not quite so common, and is more typical of late autumn or early spring than mid-winter. Deep depressions (some centres have been recorded as low as 940 to 960 millibars) sometimes occlude rapidly and may remain with irregular and slow movement within the quadrilateral 52° to 58° N. and 12° to 20° W. for periods of from three days to about a week. Such depressions generally assume the characteristics of intense polar-air depressions and a succession of instability or secondary cold fronts may move north-eastward across the British Isles. In western coastal areas, in particular, these may be associated with thunderstorms or heavy showers, generally of hail. A feature of their diurnal variation is often an intensification, or greater frequency, around midnight or the early hours of the morning; a green sky coincident with a temporary clearance or cessation of showers towards dusk is again therefore a good forewarning of pending stormy conditions, though with a shorter time interval than in the situation previously described.

On the whole, it may be said that the phenomenon of green sky towards dusk, when seen in the south-western Approaches during the winter half-year, is intimately associated with a returning Polar air-stream with a south-west to north-east, or west-south-west to east-north-east track of some 400 to 800 miles before reaching Cornwall or Pembrokeshire. Stormy or unsettled conditions are reflected in a rapid or steady increase of wind force with height, often to more than 100 m.p.h. at 20,000 or 30,000 feet, but without much change in direction. A homogeneous air-stream to great altitudes is therefore also implied.

TREVOR M. THOMAS

25 *March* 1952.

THE EMPLOYMENT OF GEOGRAPHERS

Many geographers are indebted to Mr. Giffard for his paper given at Section E of the British Association.[1]: in his letter published in the *Journal*,[2] Mr. Giffard maintains "that it is useless for the geographer to seek for *geographical* posts in industry or business or administration." I have therefore analysed the careers of the forty-six geography students who graduated with honours in Arts here from 1948–51, of whom almost all were placed in the second class. Of the thirty-four men, seventeen went into secondary teaching—most of them into grammar schools but some from choice into modern schools; one went to work in a technical college and two found University posts. This leaves fourteen, of whom three are now planners, two in textile concerns, and two in the Colonial Service: the following occupations have one graduate within the

[1] *Nature* 168 (1951) 314.
[2] *Geogr. J.* 98 (1952) 112–113.

group—museum assistantship, service with an Oil Company, employment with a chemical combine, local administration and the factory inspectorate. In two other cases the career is as yet undecided, but unlikely to be teaching. The twelve women honours graduates of the same four years have included eight teachers, one planner, one worker in the Hydrographic Service of the Admiralty, one secretary and one library trainee. Incidentally there appears to be a narrower range of posts open to women, but the number studied here is perhaps too small for one to press this point.

Admittedly the sample is small but clearly at least some graduates in geography find careers outside teaching: and even now many students wish to teach in spite of the modest rewards provided. To many entering business or administration, a knowledge of geography has proved helpful: for example, a student who has studied industrial conditions and written a thesis on an industrial area will be a suitable candidate for a post in the factory inspectorate, or a student well versed in local geography may be an admirable museum assistant. For many posts, able draughtsmanship is a recommendation, even a directly technical qualification. At the same time, most geography courses do not provide technical training similar to that given in medical schools or engineering laboratories: and many business men say that they choose the graduate-trainee from the Arts faculty chiefly on personality while recognizing that his geographical knowledge will be useful. Possibly as Mr. Green implies, University teachers of geography know little of the world of practical affairs; but the Appointments Boards of Universities can help both us and our students to appreciate the possibilities of employment for graduates. And one hopes that graduates will find work suited to their character and capabilities, allowing that some will want a post of a definitely geographical nature and others will not.

T. W. FREEMAN

University of Manchester,
4 *April* 1952.

MEETINGS: SESSION 1951–52

Thirteenth Meeting, 11 February 1952. Brigadier M. Hotine in the Chair

Paper: The Survey of India since the Second World War. By Brigadier G. F. Heaney

Fourteenth Meeting, 25 February 1952. The President in the Chair

Elections to Fellowship: John Anthony M. Baldwin, B.A.; Frank Barr; Mrs. Marjorie B. Binney; Peter R. Black, M.A.; Geoffrey G. Christian; Jeffrey Gotterell; Captain J. P. Falconer, U.S.N.; Charles P. I. Farro, B.A.; Miss Winifred J. Fisher, B.A.; Herbert S. Fitzsimmons; Stanley Glass; Alan D. Goldberg, M.A.; James H. Grimshaw; F./O. Peter Henry G. Hale, R.A.F.V.R.; Miss Eillen Mary Haworth; Lieutenant Robert T. Hess, D.S.C., M.SC.; G. W. Hughes; Dr. James H. Jauncey; Peter M. Mc I. Kemp; Rev. Father William Lawson, M.A.; Mrs. Valerie Lewallen; Michael Lister; Miss Sylvia A. Matheson; Wilfred G. Ossai; Miss Grace V. Pillar; Eric A. B. Radford; Miss Margaret Tewkesbury; S. J. Tilscher, B.A.; Ernest F. Voce; Henry Charles Wilks, B.SC.; Caradog Williams; Wing-Commander G. B. Walford, O.B.E., R.A.F.; Miss Olive Stewart

Transferred from Associate Membership: Mrs. D. M. Kerridge

Elections to Associate Membership: Miss Heather M. Cherryman; Gilbert O. Edozien; Miss Muriel Patricia Jones

Paper: The Baffin Island expedition. By P. D. Baird

Fifteenth Meeting, 10 March 1952

Film: Farrebique

Sixteenth Meeting, 24 March 1952. The President in the Chair

Elections to Fellowship: William W. Anson; Rev. Carl D. Bader; Peter Digby; Hamilton F. Duckworth; Thomas G. Evans; Miss Joyce R. Gabriel; Richard C. Graesslin, B.SC.; Peter Roderick Hale; Fred S. Hudson, B.A.; Instr. Lieutenant-Commander L. A. Kew; Ruxton C. Kiloh, B.SC.; Rev. Joseph McCracken; Sidney Melvin, M.A.; Ram Nath Mittal, M.COMM.; William H. Murray; Ernest Rex Pollard, B.SC.; Benjamin A. Saunders; Sidney G. Smith; S/Lt. Kenneth A. Symonds, R.N.V.R.; Gordon Stuart Thomas; Richard Tregaskis; Dharma Vira; Charles E. Wallington, B.SC.; Rev. Charles Welch; Rev. Dr. Frederick I. Drexler; Arthur R. Jenkins, M.A.; Mrs. I. J. Shawyer; Donald C. Powell, M.A.

Transferred from Associate Membership: Miss Dorothy M. Meyer

Election to Associate Membership: Miss Ann G. Bucknall; Miss Isabelle C. Ellis; David R. Harris; Miss Brenda Howe

Paper: Explorations in Queen Louise Land. By Commander C. J. W. Simpson, R.N.

Seventeenth Meeting, 31 March 1952. Professor J. A. Steers in the Chair

Paper: The changing physical landscape. By Professor S. W. Wooldridge

Eighteenth Meeting, 7 April 1952

Films: Wonders of Nepal. Colour Films with a commentary by Mlle. Ella Maillart

Nineteenth Meeting, 21 April 1952. The President in the Chair

Elections to Fellowship: The Rev. Dr. G. C. H. Bellshaw; Mrs. Ethel Bentley; Carel Birkby; Joseph Douglas Blair; Christopher Board; The Rev. Archibald Brown; Lt. Robin H. E. Byrne, R.N.; F/Lt. L. D. Carmichael, R.A.F.(retd.); Nathaniel J. G. Clark; Norman H. Cuthbert, B.A.; Charles Benson Dolton; Miss Maryam K. Elahi; Barry Neil Floyd; Victor Gatte, M.B.E.; Russell Gwilliam; Dr. John Fraser Hart; Captain M. R. B. Hawkins; Miss D. M. Imrie; 2/Lt. John C. H. Lanfear, R.E.; R. F. Leach, M.A.; John Frederick Leech; Edward A. Mackay, A.A., B.SC.; Edward Rucastle McCray; Peter S. Mitchell; Frederick W. Morgan; Inst. Lt. Arthur Parr, B.SC., R.N.; David Ronald Peters, B.A.; Dr. Ernest F. Roots; Alfred Saunders; The Rev. Keith Seymour; Miss Pauline D. W. Sheen; William Rice Todd; Dr. George Trapp, M.A., B.SC., B.COM.; P. L. K. Wait; Robert Anthony Webb; Douglas Wood

Elections to Associate Membership: Miss Margaret Batt; Miss Ruth Alice Cory; Miss Andree M. Harte; Miss Margaret G. Kemp

Paper: The conquest of Annapurna. By M. Herzog and M. de Noyelle

THE ROYAL GEOGRAPHICAL SOCIETY

KENSINGTON GORE, LONDON, S.W.7

FELLOWSHIP AND ASSOCIATE MEMBERSHIP

The object of the Society being the Promotion and Diffusion of Geographical Knowledge, it has always welcomed to its Fellowship those anxious to further this object by their interest and support, as well as those able to take a more active part in the work of discovery and exploration.

It is provided by Chapter III, § 1, of the Bye-Laws that a candidate for admission to the Fellowship of the Society must be proposed and seconded by Fellows. Further, that a candidate is not to be considered eligible until he has attained the age of twenty-one years, unless he holds a Commission in Her Majesty's Forces or is a matriculated student of a University of the United Kingdom or the Self-Governing British Dominions. Proposal forms can be obtained on application to the Director and Secretary, who will also lend if necessary a List of Fellows.

Chapter V, § 1, of the Bye-Laws provides that—

(a) Every Fellow (other than those elected under Chapter III, § 6) shall, except as provided below, be required to pay either on Election Five pounds as Entrance Fee and Three pounds as Annual Subscription for the current year and thereafter an Annual Subscription of Three pounds due on January 1 in each year ; or instead of an Entrance Fee on election an enhanced Annual Subscription of Four pounds for the current and five following years, and thereafter Three pounds ; or a single Compounding Fee of Sixty pounds.

For Fellows who are under the age of 25 years on election the Entrance Fee shall be reduced from Five pounds to Two pounds ; or alternatively the enhanced Annual Subscription of Four pounds shall be payable for the current year and for two following years instead of for five.

Fellows who are on election the wives or husbands of Fellows shall pay no Entrance Fee.

Fellows who are on election the widows or widowers of Fellows shall pay no Entrance Fee if elected within one year of the decease of husband or wife.

(b) Fellows may compound for their Annual Subscriptions at any subsequent time by a payment of £60 (sixty pounds) less £2 (two pounds) for each Annual Subscription paid in excess of five with a minimum of £20 (twenty pounds) after 25 payments.

(c) No Fellow shall be entitled to vote or to enjoy any privilege of the Society while in arrear.

Chapter IIIa of the Bye-Laws, covering the terms of Associate Membership, provides that—

1. Candidates must be not less than 17 and not more than 20 years of age. They must be recommended by a Fellow, University or School authority.

2. Subscription shall be £2 per annum without Entrance Fee.

3. On attaining the age of 21 Associate Members become eligible for Fellowship. The Entrance Fee of £2 shall be waived provided they have been Associate Members for 3 years. Otherwise Associate Membership shall cease at the age of 21.

All subscriptions are payable in advance, on the 1st of January in each year.

The privileges of a Fellow or Associate Member include admission (with one Friend) to all ordinary Meetings of the Society, and the use of the Society's House, Library, and Map-room. Each Fellow is also entitled to receive a copy of all the Society's Periodical Publications. Associate Members have the choice of receiving either *The Geographical Journal* or *The Geographical Magazine*. Associate Members may not describe themselves as F.R.G.S. and have no vote at Annual or Special General Meetings.

A pamphlet giving a brief History of the Society, with a description of its Work and Publications, its Charter and Bye-Laws, and an illustrated account of its House in Kensington Gore, can be sent to anyone interested on application to the Director and Secretary.

Made and printed in Great Britain
for the Royal Geographical Society
by William Clowes & Sons, Ltd., Beccles
Entered as second class mail matter (5 January 1898) in the
New York Post Office, N.Y.